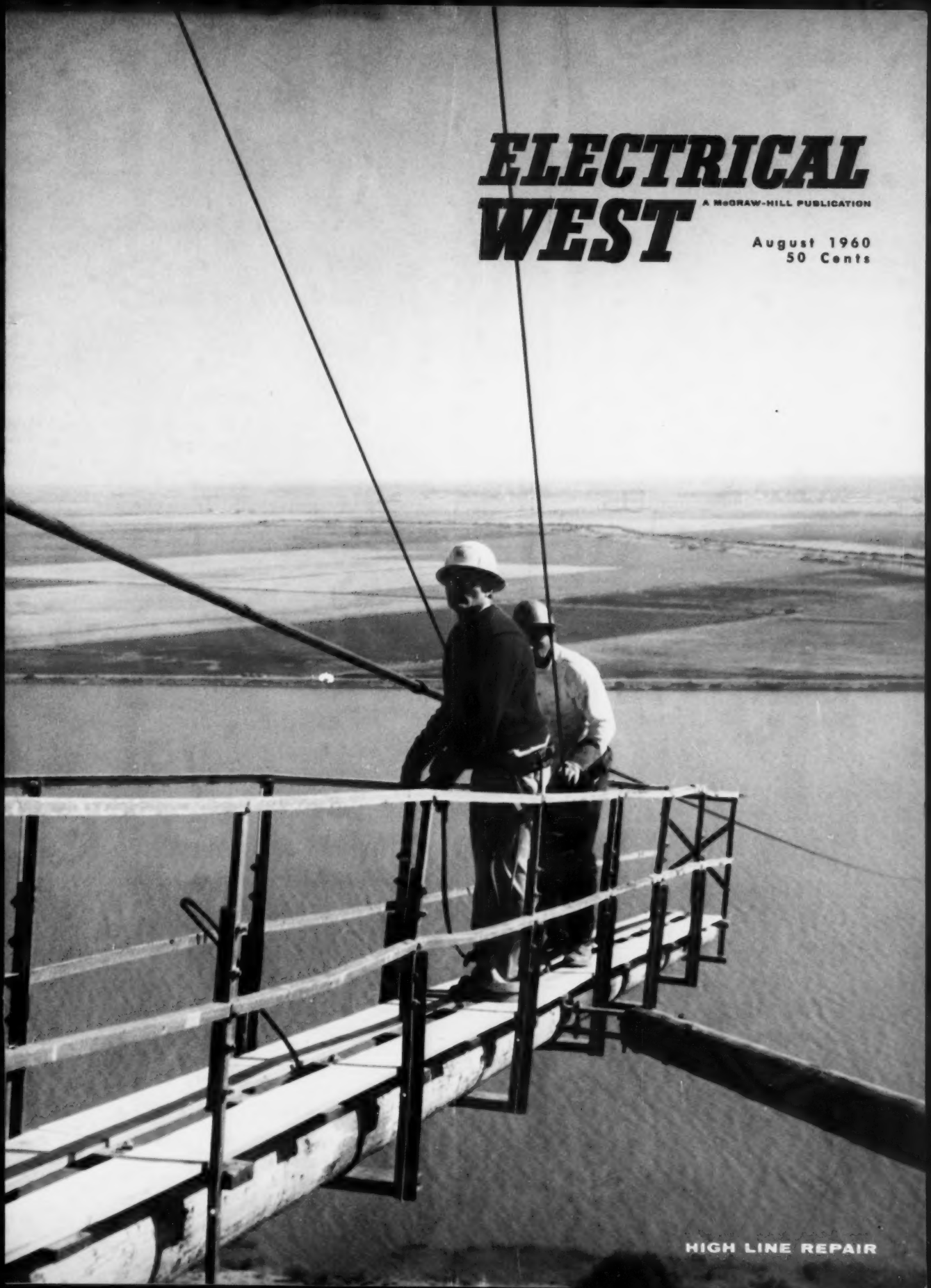


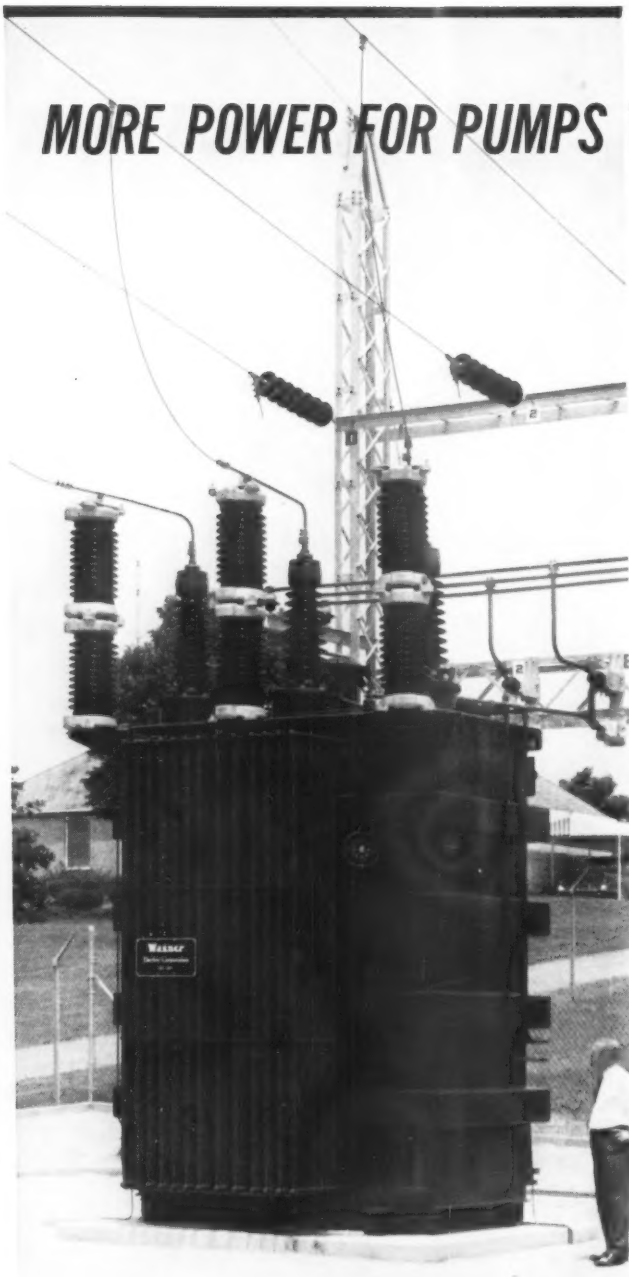
ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

August 1960
50 Cents

HIGH LINE REPAIR

MORE POWER FOR PUMPS THAT PUSH PETROLEUM



THIS WAGNER TRANSFORMER

POWERS-UP

PLANTATION PIPELINE

The Plantation Pipeline Company pumping station at Neese, Georgia, is part of an underground transportation system that pushes high quantities of petroleum products to their market.

The Neese operation was originally served with power from a 44 kv system substation. However, the size of the pumping load—which includes some 1800 hp motors—became too great for the substation to handle adequately.

To better serve the load, Georgia Power Company recently installed a 110 kv line and built a new substation. Wagner Electric Corporation furnished the transformer rated at 7500 Kva for this purpose. Today, Plantation Pipeline pumps with full power.

Now, what about your power needs? If they present a critical (or even a potential problem), call your nearby Wagner Sales Engineer. He'll help you plan your power program . . . suggest Wagner transformers that will meet your needs for years to come. There are Wagner branches in 32 principal cities.

Wagner Electric Corporation

6381 PLYMOUTH AVENUE,
ST. LOUIS 33, MISSOURI

WT60-8

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL • AUTOMOTIVE*

editorial views EW

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POSTURE FOR A POLITICAL YEAR

In the forthcoming year as never before we will be observing politics in action. The outcome will have much to do with our lives. Matters of direct concern to us in both a business and personal way will be planks in each party's platform. In the face of what is becoming a politically directed economy, we cannot escape the conclusion that to survive we must become politically effective. In a country whose direction is in the hands of the people, failure to take part is as morally wrong as tax evasion or draft dodging. *This is America and we have to accept the whole package.* This includes an active part in politics.

Perhaps a hard look at our excuses will be revealing.

Leave politics to the pros.

Politics is dirty.

I really wouldn't be much help.

My company doesn't want me in politics.

Politics Is People—and always will be. In the presence of PR men, lobbyists, corporate citizens, the notion grows that these *professionals* have the matter in hand. Not so! A politician would scoff, "corporations don't vote and the words of their spokesmen are received tongue in cheek." These professionals best serve by making the issue clear. But only people make it effective.

Politics is much like business. It's practical. It's "ruff 'n tumble"—sometimes vicious. They play for keeps. When the good guys lose, they can cry if they want, but they had best plan how to win next time. There's no "A" for effort. It's no game for a Pollyanna—or a hopeful idealist. After listening to a real political campaign, the comment was made "this guy makes Wyatt Earp sound like a pansy."

To scorn politics as "dirty" is perhaps an admission that we don't really understand the world we live in. Is there anyone who wouldn't welcome Khrushchev's skills to our team?

In politics hard work really pays off. Harry Truman's great campaign of 1948 is typical. He did it with a minimum of party support. In endless variation he said, "my name is Harry Truman and I want to keep my job." He said this to millions and won. This victory was a personal one. It underscores how a small group of hard workers can be politically effective. It will be the work, not the money, that will bring victory in '60.

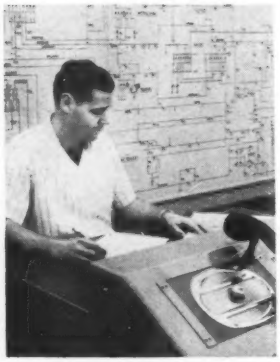
Want to get a school bond through or a new city council? Take to the pavement if you want to win.

Politics is a personal obligation. No company, for a pay check, buys your vote. We need active effective industry people in both parties. Edison's Jack Horton recently made it clear, ". . . It's a calculated risk we're going to have to take. . . . I think we need to do everything we can—including taking an active part in political campaigns to influence the political climate in Sacramento and Washington."

Many of us have given years to the protection of our country. And 25% of our income goes for its operation. A small investment of personal time to direct it would seem to be the essence of common sense.

It can't be delegated. George won't do it.

450 Feet Up—59



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ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S. Established 1887

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The Cover

Up 450 ft, the men on the cover are repairing PG and E's Vaca-Contra Costa line near the Rio Vista crossing. They are A. C. Hutchins, general foreman, PG and E, left, and Robert L. Hyde, electric conductor field advisor, Rome Cable Division, Alcoa. (See photo at top of page.)

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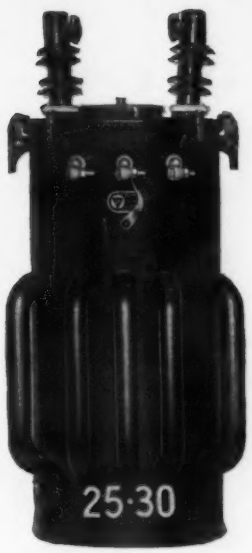
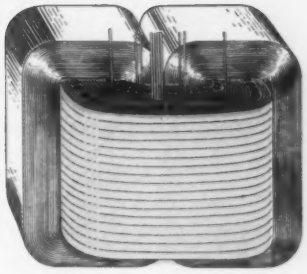


L-M transformers exclusively incorporate a core-type core-and-coil design, designated Round-Wound®. It is a continuously wound single core with coils wound directly on each leg. This exclusive design, illustrated by the color area, permits oil ducts to be concentric about the entire winding. Maximum winding area is exposed to oil for rapid and efficient cooling. For any given loading, Round-Wound transformers have considerably lower hottest-spot temperatures and therefore greater life expectancy.



Every major manufacturer of competitive transformers utilizes a shell-type core-and-coil design. Oil ducts, illustrated by color area, can not be placed in the portion of winding under the cores. Heat is trapped and hottest-spot temperatures build up. Circulating oil can not get to these spots to carry the heat away. Result: oil stays fairly cool, while windings sizzle. Insulation deteriorates most rapidly in these areas, with an appreciable reduction in transformer life.

Uprate L-M Round-Wound® Transformers Without Any Loss of Life Expectancy

All L-M Round-Wound transformers, serial number 1,700,000 or above (serial number 7,006,650, Visalia, California production), can be safely uprated. This uprating applies to transformers now in service or in your stocks. It includes all L-M transformers produced within the last 2½ years. Only L-M can safely offer this unprecedented uprating because of the exceptional cooling characteristics of the Round-Wound core-coil construction. You get the following bonus uprating on Round-Wound transformers:

20% bonus: 5-15 kva, through 16,340 volts
20% bonus: 25 kva, through 8,000 volts
12% bonus: 25 kva, 12,000 through 16,340 volts
12% bonus: 37½-100 kva, through 16,340 volts
5% bonus: 167 kva, through 16,340 volts

Increased transformer loading and decreased transformer life expectancy are closely related. As over-loading increases, transformer insulation breaks down, jeopardizing transformer life expectancy.

Average winding temperature can be partly indicative of the damaging effects loading has upon transformers. Hottest-spot temperature, however, the maximum temperature within a transformer winding, is the one sure indicator of potential winding failure. If the hottest-spot or maximum winding temperatures are held within safe limits, winding insulation is not jeopardized and normal transformer life expectancy is maintained.

Only the Line Material exclusive Round-Wound design can effectively cool the entire winding, eliminating extreme hottest-spots. Round-Wound core and coils have concentric cooling. The oil is free to circulate through the entire winding. There are no cramped areas, no extreme hottest-spots in Round-Wound design. That is why Round-Wound transformers, without re-design, can confidently be uprated —higher than any competitive design.

You can uprate Round-Wounds without exceeding the present ASA-NEMA standard of 65°C allowable maximum rise in winding hottest-spot temperature. And the uprated transformers carry the full L-M transformer guarantee.

The present design of Round-Wound transformers have been in production for over two years. Thus, the Round-Wounds on your system, in your warehouse, as well as those you buy tomorrow, have bonus capacity and may be confidently uprated.

See your L-M Field Engineer. Let him present all the logical evidence. Then . . . YOU BE THE JUDGE.

You BE THE JUDGE!

- This is one of a series of advertisements in which Line Material is presenting facts on distribution transformers.
- In other advertisements, and through calls by our Field Engineers, L-M will present additional evidence for your consideration.
- All we ask is that you listen to the facts, and weigh the evidence.
- Then YOU BE THE JUDGE of the real values in distribution transformers.

LINE MATERIAL® Industries Transformers
McGRAW-EDISON COMPANY

476

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS
OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW-EDISON

NOW!

MAXIMUM HOUSEPOWER FOR ALL-ELECTRIC HOMES

with BullDog's 200-Amp distribution service center

Provide better electrical living with BullDog's PL12A Pushmatic Electri-Center®! This residential distribution service system supplies 34 circuits to feed electric heating, air conditioning, range, oven, water heater, dryer, plus lighting and general purpose circuits . . . all from a single compact 200-Amp 12-circuit panel! (See diagram at right.) For further information contact:

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit, Michigan.
In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

Consult the following Pacific Coast representatives:

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1733 N. E. Seventh Ave., P. O. Box 7866
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910-89th Avenue
Oakland 21, California

BullDog Elec. Prod. Co. of Los Angeles
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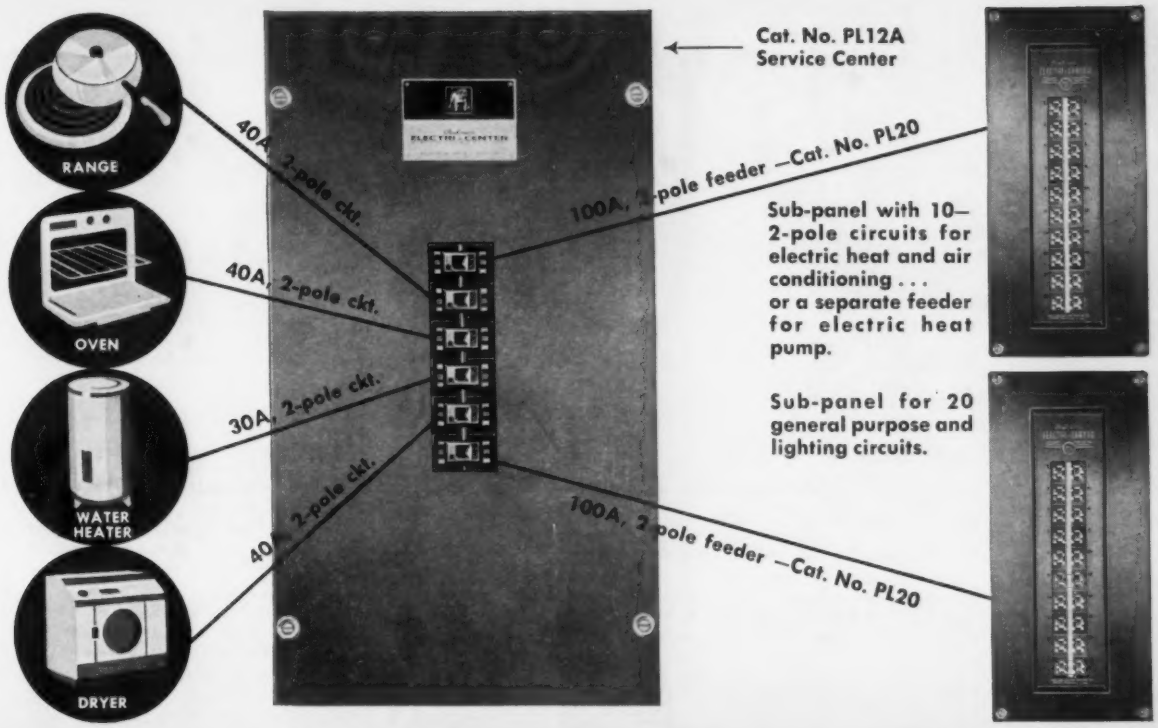
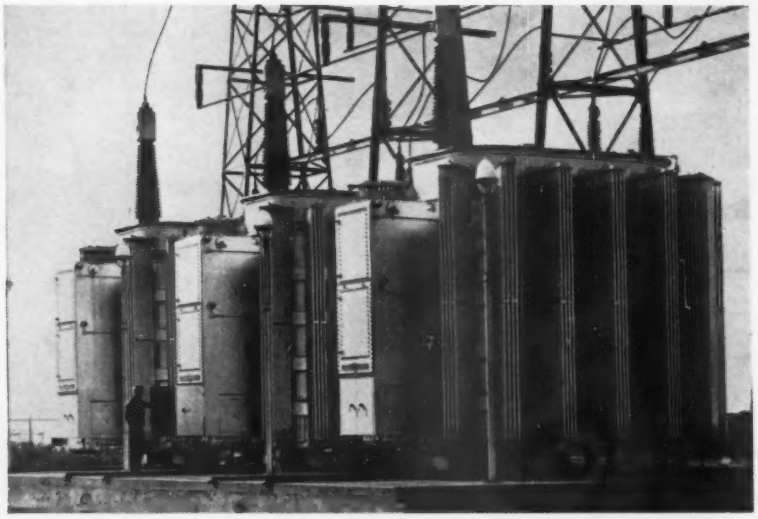

RANGE
OVEN
WATER HEATER
DRYER
40A, 2-pole ckt.
40A, 2-pole ckt.
30A, 2-pole ckt.
40A, 2-pole ckt.
Cat. No. PL12A
Service Center
100A, 2-pole feeder —Cat. No. PL20
Sub-panel with 10—2-pole circuits for electric heat and air conditioning . . . or a separate feeder for electric heat pump.
Sub-panel for 20 general purpose and lighting circuits.
100A, 2-pole feeder —Cat. No. PL20



FOUR PRINCIPLES FOR TRANSFORMER PAINTING

1. **Color.** There is a direct relationship between color and operating temperature. Subox paints are made in modern colors to meet *present-day peak load requirements.* They are available in standard grays, and also in decorator shades for color-styling in residential neighborhoods.
2. **Film Thickness.** When repeated coats of paint build up on a transformer they tend to act as a blanket and hold the heat in. With Subox paints, *fewer coats are needed* and internal heat is more efficiently dissipated.
3. **Long Life.** The paint on a transformer is subject to wide temperature changes. *All Subox paints contain suboxide of lead.* This unique pigment remains chemically active even after drying; builds a tough, fibrous film that maintains flexibility and does not crack, chip, peel or blister even under the most punishing conditions.
4. **Film Structure.** Aluminum-containing paints are often desired because they reflect sunlight; however, in conventional paints of this type the aluminum flakes overlap and leaf together to form an insulating barrier. In our Subalox paints, the polished aluminum flakes are non-leafing and do not overlap. Therefore, they promote both reflection and better radiation.

Leading electric utility companies use Subox paints for transformers. Write for color card and literature.

SUBOX PAINTS

Subox Inc.

Trade Mark

Established 1924

The Ambler Co., Denver, Colo.
Fred W. Carlson & Assoc., Butte, Mont.; Seattle, Wash.
Wm. J. Cottrell & Assoc., Portland, Ore.
R. E. Cunningham & Son, Los Angeles, Calif.
Wrathall & Krusi, San Francisco, Calif.
Plant and office: Hackensack, New Jersey
Subox Co. of Canada, Weston, Ontario

Meetings Calendar

AUGUST

8-12—*American Institute of Electrical Engineers,* Pacific general meeting, El Cortez Hotel, San Diego.

23-26—*Western Electronic Show & Convention,* Memorial Sports Arena, Los Angeles.

SEPTEMBER

7-9—*Northwest Electric Light & Power Assn.,* 53rd annual meeting, Glacier Park Lodge, Mont.

7-10—*Rocky Mountain Electrical League,* annual meeting, Denver Hilton, Denver, Colo.

12-14—*International Association of Electrical Inspectors,* Northwestern Section, Sheraton-Portland Hotel, Portland.

14-15—*Northwest Public Power Assn.,* Accounting Section, annual meeting, Wenatchee, Wash.

18-24—*IAEI,* Southwestern Section, Mapes Hotel, Reno.

29—*San Diego Bureau of Home Appliances,* annual fall conference, Balboa Park, San Diego, Calif.

29-30—*NWPPA,* Power Use Section, annual meeting, Hotel Monticello, Longview, Wash.

OCTOBER

17-22—*National Association of Electrical Distributors,* Western Region convention, Stardust Hotel, Las Vegas.

23-27—*National Electrical Contractors Assn.,* national convention and exposition, Las Vegas.

NOVEMBER

14-15—*Pacific Coast Electrical Assn.,* Administrative Services Section, Phoenix, Arizona.

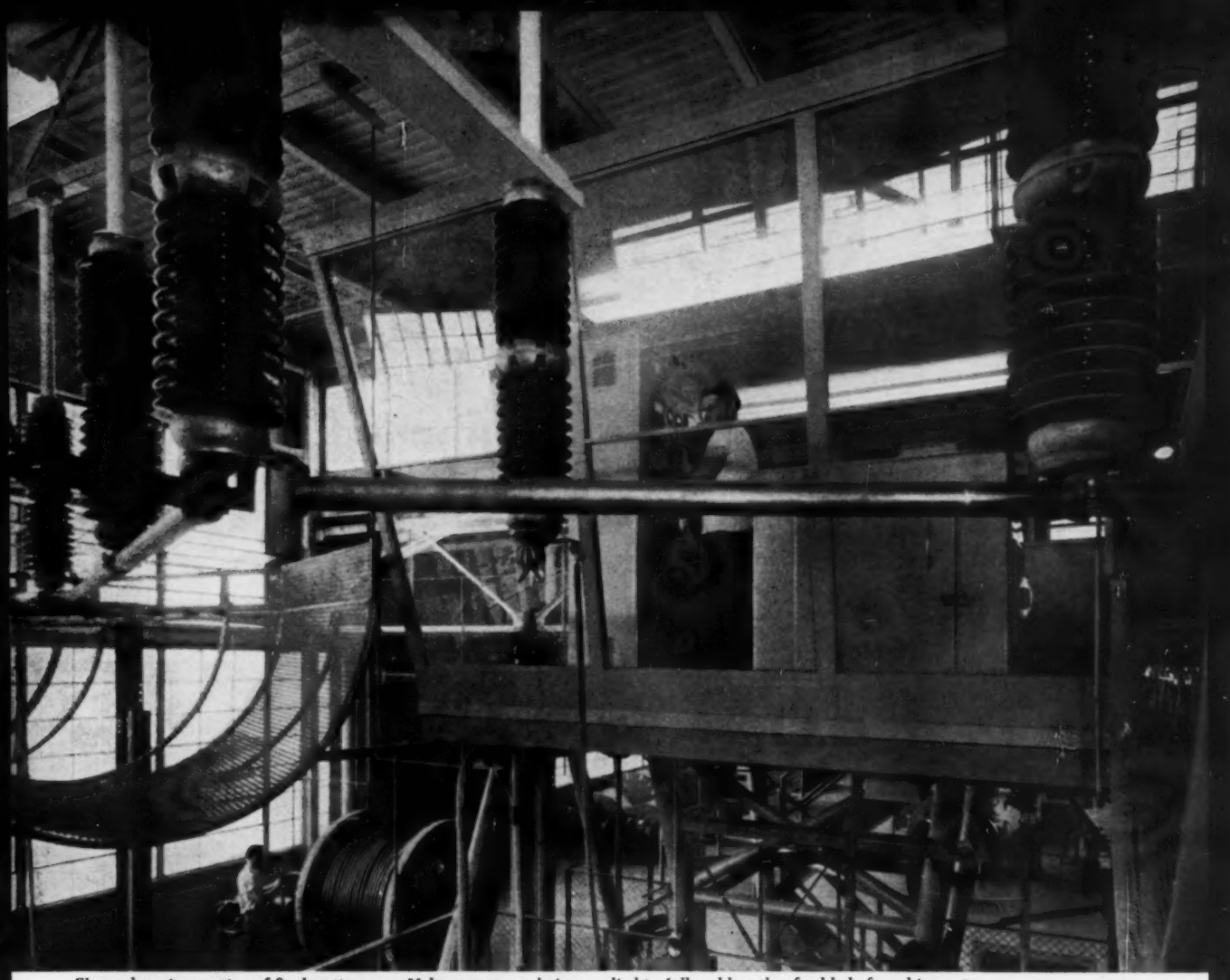
25-Dec. 3—*San Diego Bureau of Home Appliances,* annual Electric and Home Appliance Show, Electric Building, Balboa Park, San Diego, Calif.

DECEMBER

12-15—*Atomic Industries Exhibition,* Masonic Auditorium, AIF—Fairmont Hotel, ANS—Mark Hopkins Hotel, San Francisco.

JANUARY 1961

16-20—*San Francisco Winter Market,* Merchandise Mart.



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE—

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, tests and sampling at our plant offer extra protection even before production begins. **To finish:** Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be of high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath* Cable." For your copy, write to: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. *Reg. U.S. Pat. Off. 60286

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

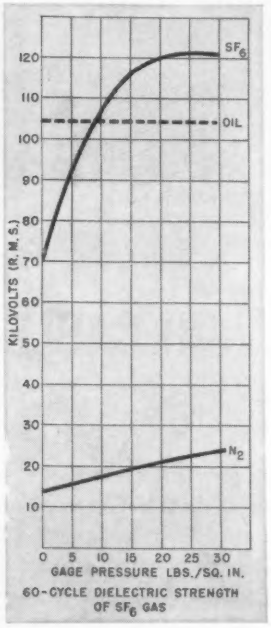
FASTEST WESTERN SERVICE—At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for every type of application. Anaconda assures the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

ONE OF A SERIES . . .

Improved safety to system, personnel and equipment provided in new SF_6 gas breaker

. . . improved performance from 69 to 460 kv and beyond

The unusual characteristics of the new arc extinguishing medium, SF_6 (sulfur-hexafluoride) gas, have made possible a power circuit breaker of unequaled safety. For example, a single operating mechanism mechanically connected so that all contacts open and close simultaneously insures reliable relay operation. Additional benefits are found in its dead-tank construction, low, accessible design and an advanced interrupting technique.

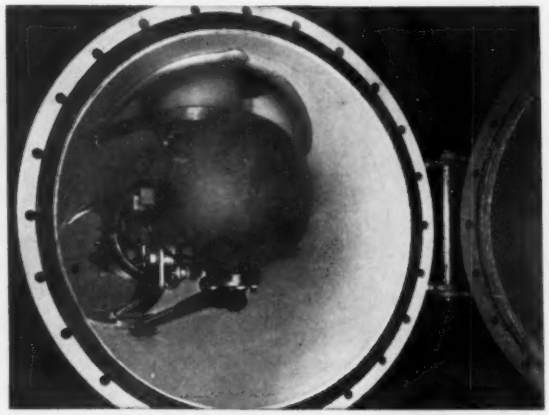


60-CYCLE DIELECTRIC STRENGTH OF SF_6 GAS

Most important for breaker applications is the arc-quenching ability of SF_6. The gas is able to change the arc path from a good conductor to an excellent insulator in a few microseconds following current zero. This remarkable electronegativity characteristic makes SF_6 an ideal interrupting medium.

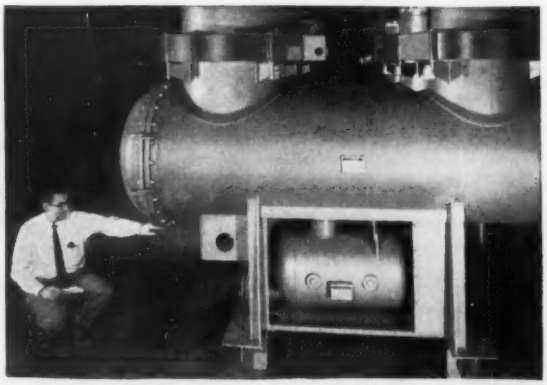
During arcing, a negligible quantity of SF_6 is decomposed. After the arc is extinguished, however, practically all of these decomposition products recombine to form SF_6. The minute remaining gaseous arc products are effectively removed by filters of activated alumina.

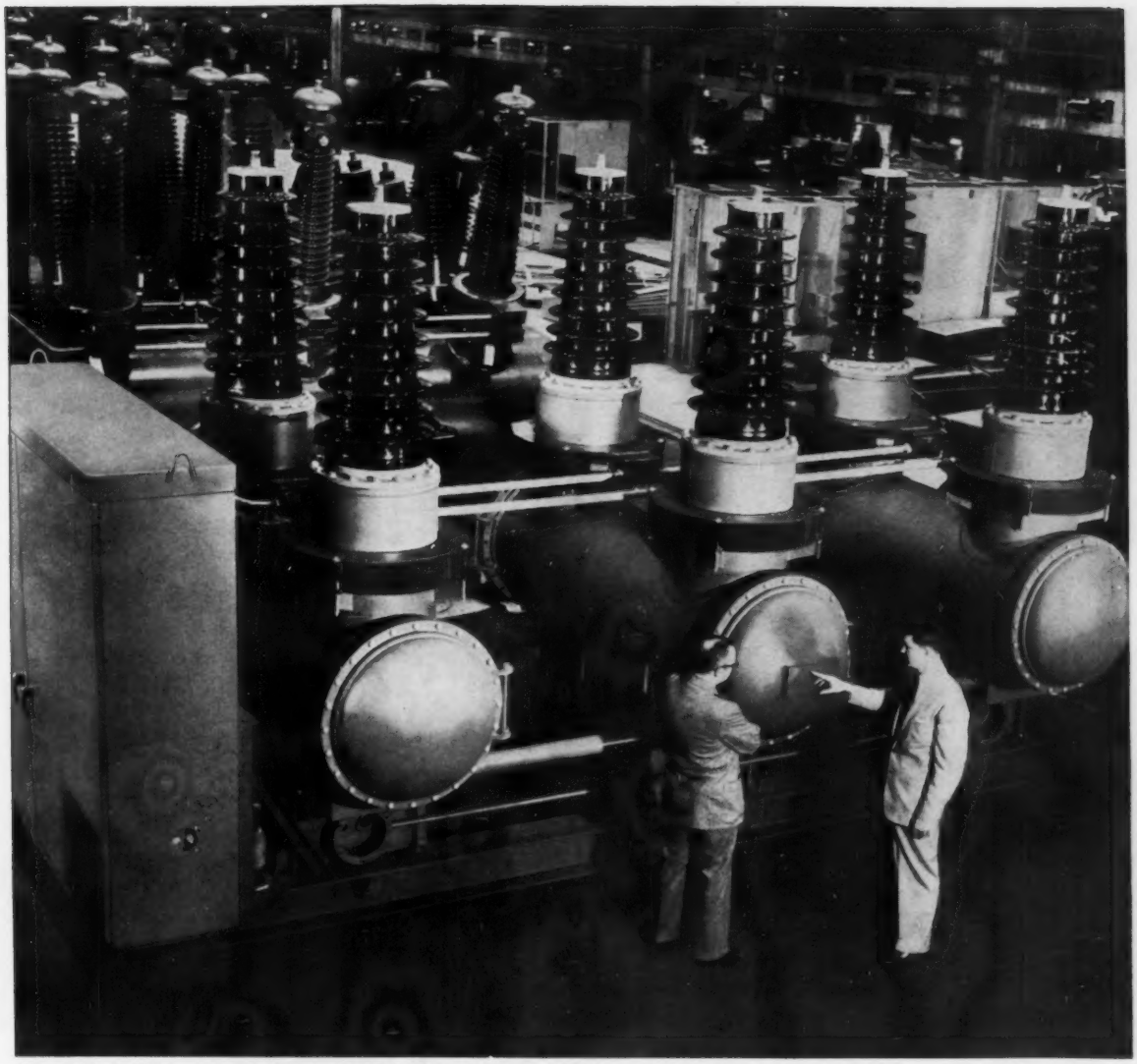
The high dielectric strength of SF_6 at relatively low pressure makes practical a dead-tank design of minimum size and weight. Dead-tank construction



permits operating personnel to work near the energized breaker in complete safety.

Clearances in the compact 230-kv tank were tested at the High Voltage Lab . . . found more than adequate to withstand 60-cycle test voltage of 425 kv and BIL test voltage of 900 kv at normal pressure . . . and still withstand *twice* line-to-ground system voltage at *zero* gauge pressure.

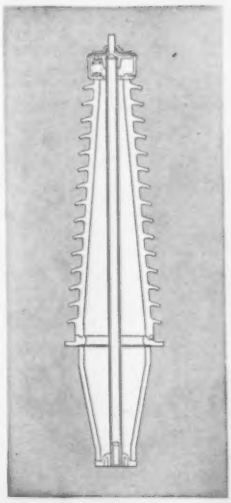




Inert SF_6 is both nonflammable and nontoxic, providing a breaker with the inherent safety needed in all installations.

Use of a horizontal interrupter in the Westinghouse breaker provides another important personnel safety factor. The interrupter is readily accessible at ground level . . . no ladders or scaffolding is needed to make inspections.

In the Westinghouse breaker, current transformers are provided on both sides of each pole. This design makes possible overlapping relay protection. Also, provision is made for mounting two CT's around each bushing. Being externally mounted, they are easily installed.



For the first time in more than half a century, Westinghouse has deviated from its proved condenser bushing design to provide another forward step in the new SF_6 gas breaker. The drawing at left shows the hollow bushing which is open to the main breaker tank and filled with SF_6 gas, a self-healing dielectric. There is no organic insulation to break down. There is no porcelain under high pressure as an added safety factor.

To learn more about the increased breaker life, reduced maintenance and lower installation cost of the SF_6 gas breaker, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-61004

Westinghouse

For phone number of closest representative see advertising index in back of book.

Are the appliances you want most in the new home you plan to buy?

Every MEDALLION HOME has an all-electric kitchen with electric range and oven—and more from this list of additional appliances:

Electric DRYER
Electric WASHER
Electric DISHWASHER
Electric REFRIGERATOR
Electric WATER HEATER
Electric GARBAGE DISPOSER

The Medallion award on a new home guarantees you major electrical appliances, already installed. And you get ample wiring ... full Housepower for future needs ... *plus* lighting which is both functional and beautiful.

So look for the Medallion—national symbol of better housing and modern electric living. It identifies today's best new-home buys in every style, size, location and price range. No family should buy a home without the Medallion Home award.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

ARE YOU TAKING ADVANTAGE OF THE ADDED KVA CAPACITY OF GENERAL ELECTRIC'S 55°◎65° DISTRIBUTION TRANSFORMERS?

GENERAL ELECTRIC

55° 65°
75/84
37.5/42
50/56
100/112
15/16.8
5/5.6
10/11.2
25/28

Why settle for less, when . . .

General Electric Transformers give you added KVA, with the same operating life– at no price premium

Major insulation development provides 12 percent more kva capacity. Here are the facts . . .

General Electric's complete line of oil-filled **55°●65°** distribution transformers provides 12 percent more kva capacity—at no price increase or loss in normal operating life. This added capacity is made possible by using Permalex* insulation—a major innovation in transformer insulation systems which was developed by General Electric and is used in oil-filled distribution transformers.

The use of superior Permalex insulation permits transformer operation at higher average winding rise (65 C) without loss of normal operating life. This means you can carry 12 percent more kva with General Electric Permalex insulated transformers.

Every General Electric **55°●65°** transformer has a second nameplate kva rating. The new, higher rating reflects the 12 percent kva increase—allowing you to utilize the added capacity within your established loading practices. *And the new rating retains the same design margin between stated temperature rise and actual rise—consistent with traditional General Electric distribution-transformer design practices.*

General Electric's new approach to greater kva capacity is accomplished through advanced interior transformer design. Permalex transformers retain the same small size and light weight—but with substantially increased kva capacity.

Before you buy another transformer, ask your G-E Sales Engineer to show you the story of the **55°●65°** transformer. It takes just a few minutes and can save you many dollars in transformer investment and operation. Or, write for more information to Section 482-08, General Electric Co., Schenectady, N. Y.

*Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

COMPLETE LINE OF 55°●65° POLE-TYPE TRANSFORMERS now available from G-E warehouses across the country. Instrumental in the development of this new transformer design were Dr. R. Flowers, insulation laboratory chemist and co-inventor of patented cyanoethylated kraft; J. Silverstein (front), Product Planning Specialist; and J. Leslie, insulation laboratory chemist.

For phone number of closest representative see advertising index in back of book.

"OUR HEAD TOO BIG?"

NO!

we've just enlarged the hat!

We are proud of our recently expanded plant because it gives us more room to grow. But more important, we can now carry a larger and more complete inventory which will help us fill your orders faster than ever before. Test us, you'll see. Our service can't be beat.

Our model is two-year-old Karen Floyd, another granddaughter of Al Johnson, president of Alwalt Manufacturing Company and Circle A-W Products Company.

Circle A-W Products Manufactured by **Alwalt Manufacturing Company**

WIRING GUTTER AND FITTINGS
TRANSFORMER CABINETS
HINGE COVER-BOXES
UTILITY BOXES
HINGE COVER WIREWAY AND FITTINGS

KEEP PACE ELECTRICALLY

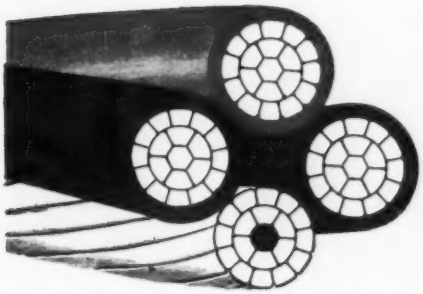
METER AND BREAKER ASSEMBLIES
SCREW COVER-BOXES
WEATHERPROOF BOXES
CABINET BOXES
METER TROUGHS

CIRCLE A-W PRODUCTS Co.
P.O. Box 1171, Modesto, Calif.

For phone number of closest representative see advertising index in back of book.

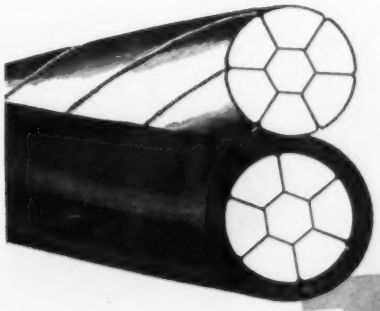
COLOR EVOLUTION

Triplex Secondaries by **SOUTHERN ELECTRICAL** Take on Lasting Color With **HYPALON®***



COLOR-CODED CABLES Insulated With HYPALON® Have These Major Advantages:

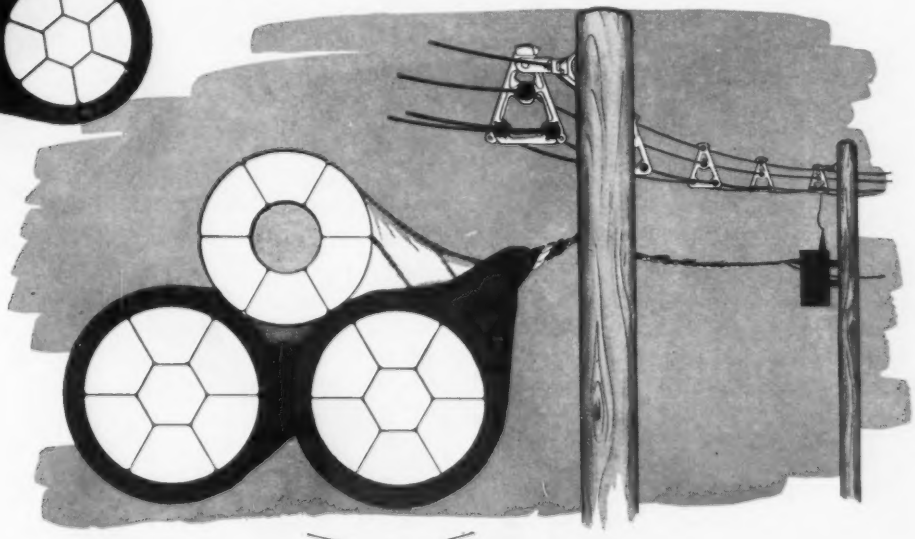
- Positive phase identification, permitting load balancing;
- Available in black, electrical red and electrical grey;
- Outstanding resistance to ozone;
- Excellent resistance to heat, chemicals, flame;
- Improved resistance to compression cutting when used on COMPRESTO®;
- HYPALON® can be stripped freely at field temperatures;
- Electrical properties of HYPALON® permit its being rated as a 600-volt class multiplex cable.



*Synthetic rubber covering with properties that exceed Two-Coat coverings for service drop cables.

Hypalon® is a registered trademark of E. I. du Pont de Nemours & Co., Inc.

Compresto® is a registered trademark of Southern Electrical Company.



Southern Electrical Company

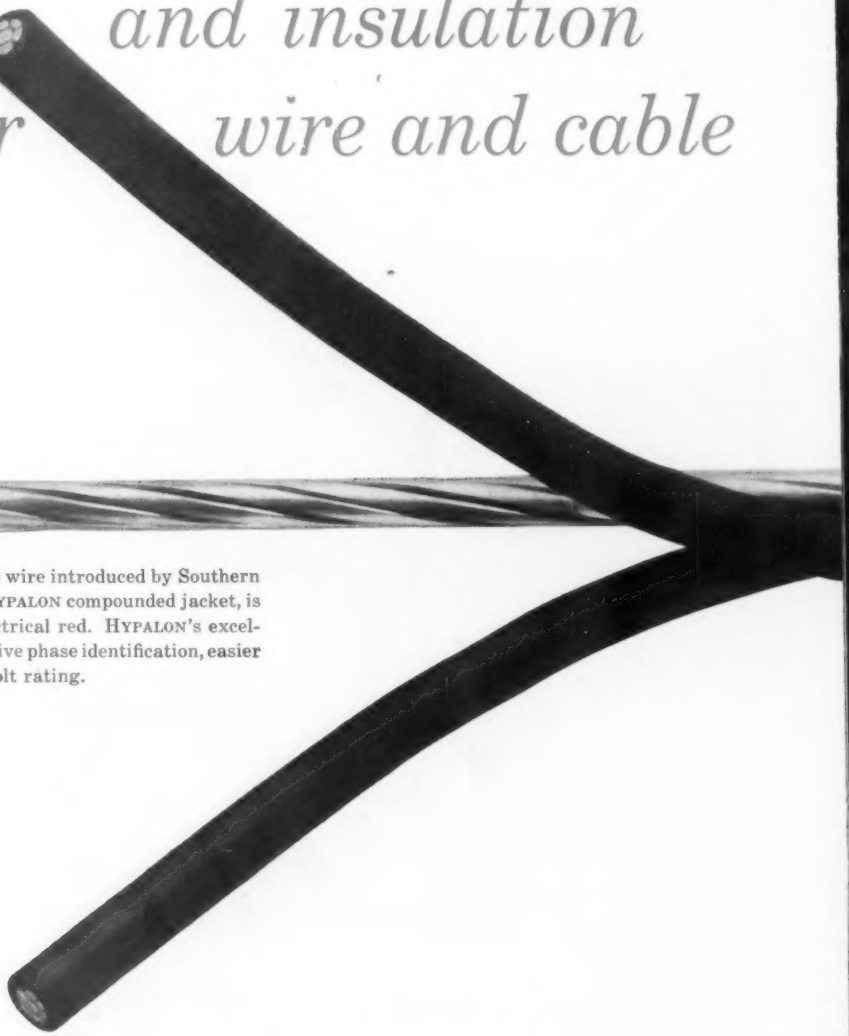
OLIN MATHIESON • METALS DIVISION • CHATTANOOGA, TENNESSEE

OLIN ALUMINUM

See next page

Another new development from Du Pont:

Hypalon®...an improved jacketing and insulation material for wire and cable

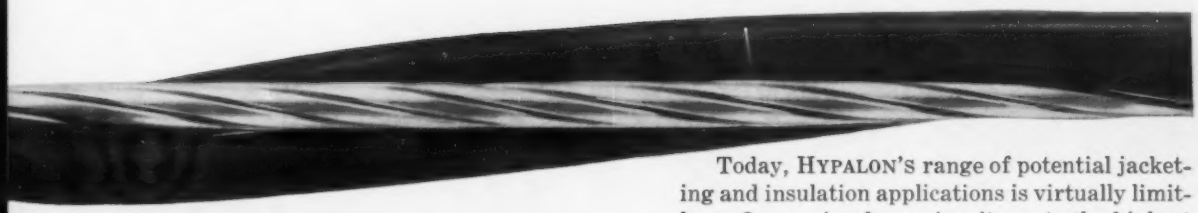


New insulated secondary phase wire introduced by Southern Electrical Company, using a HYPALON compounded jacket, is available in black, gray or electrical red. HYPALON's excellent color retention means positive phase identification, easier tap-in. New cable has a 600-volt rating.

New synthetic rubber combines excellent mechanical and aging properties...permits color coding of high-performance triplex secondary cable

The key improvement in this new triplex secondary cable is jacketing and insulation of tough, weather-resistant Du Pont HYPALON. Designed to meet the requirements of increased power consumption—brought on by a growing population and heavier industrialization—the cable relies on new Du Pont HYPALON synthetic rubber to provide a combination of properties found in no other jacketing material.

For example, HYPALON's permanent colorability now permits color coding of secondary network cable for positive phase identification. Its exceptional resistance to heat and flame assures safe, dependable operation during periods of severe electrical overload. HYPALON's outstanding resistance to weather, aging, ozone, sunlight, abrasion, oil and chemicals means long life and economical performance under every condition encountered in rugged line service. And HYPALON's electrical properties permit a single extrusion to act as both insulation *and* jacket . . . resulting in a significant reduction in wall thickness.



Today, HYPALON'S range of potential jacketing and insulation applications is virtually limitless. On service drop wire, it meets the highest requirements for insulation . . . provides needed resistance to burning or flowing at high temperatures. Other potential uses include spaced aerial cable (rated at 15 KV and up), direct burial power cable, automotive wire, mine trailing cable, building wire and appliance cord. Explore the many ways HYPALON jacketing and insulation can improve performance of the cable you use. For information, write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-8, Wilmington 98, Delaware.

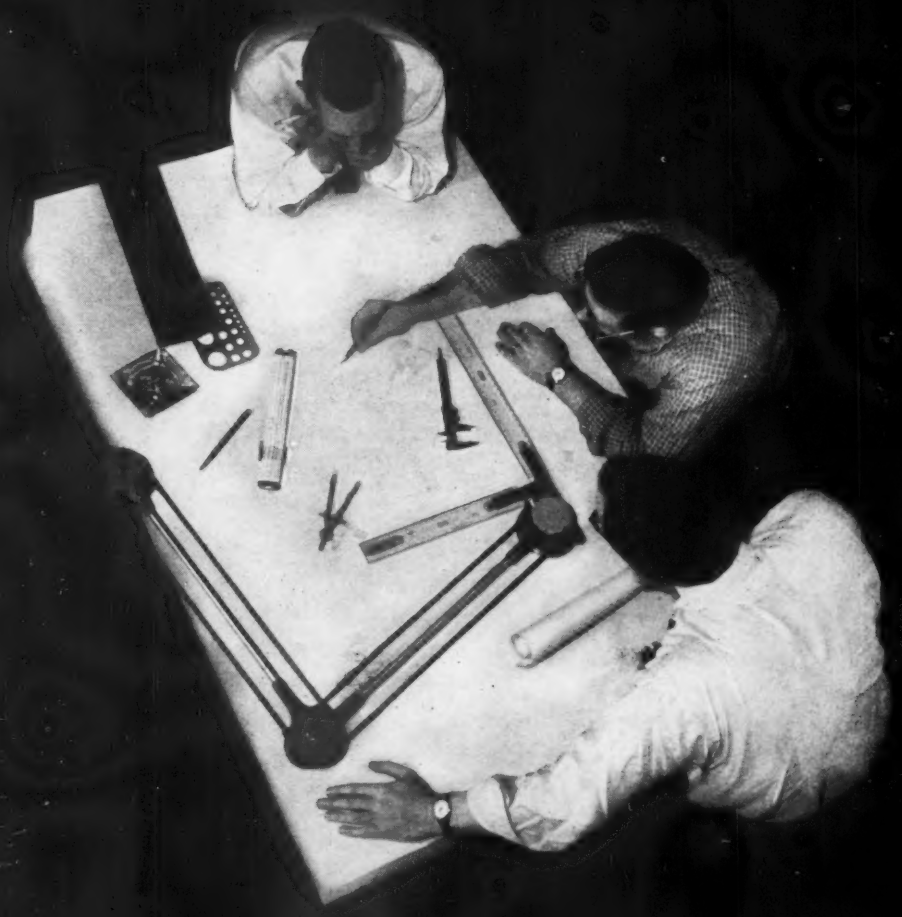
Atop a utility pole, a Community Public Service lineman strings Compresto® triplex secondary wire near Texas City, Texas. CPS was the first to install new HYPALON jacketed secondary cable.

HYPALON®
SYNTHETIC RUBBER

DU PONT
REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

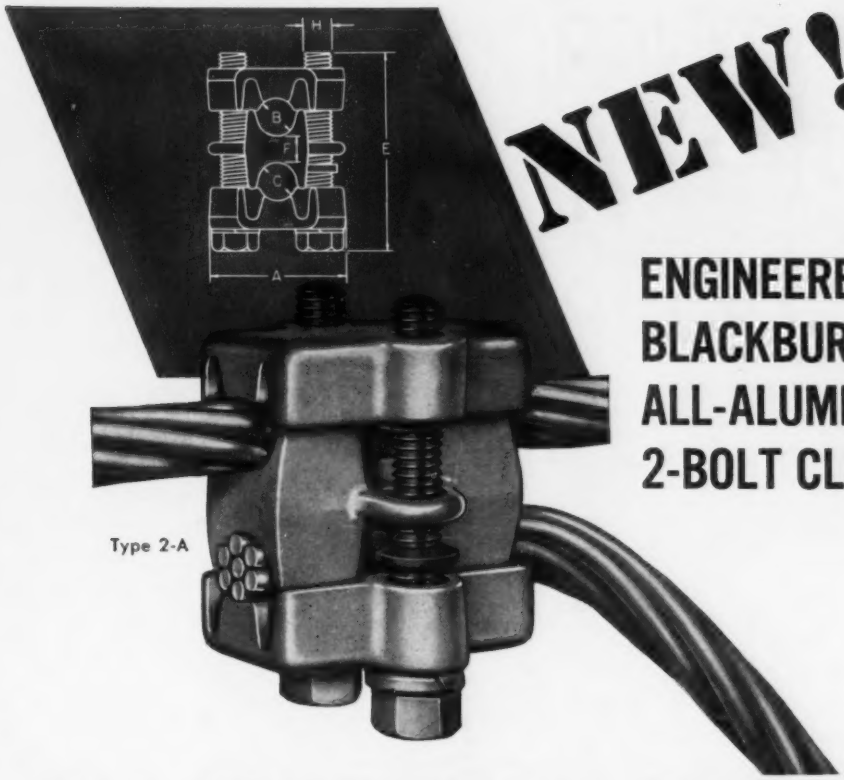
CONCENTRATION



RT&E was founded and operates today on a very basic premise: do one thing and do it better than anyone else. That's why you'll find engineers at RT&E thinking and doing things with transformers that nobody else has ever done . . . why engineering talent at RT&E is concentrated on *one* idea . . . a better transformer. This concentration can pay off for you. Proof? Write for Bulletin 101.

RT&E Corporation • Waukesha, Wisconsin • Portland, Oregon • Arlington, Texas

00



Type 2-A

NEW!

ENGINEERED INTO BLACKBURN ALL-ALUMINUM 2-BOLT CLAMPS...

ALL WEATHER PROTECTION

On Aluminum or Bi-Metallic Connections

Contact surfaces guarded by rainshield design of castings—inhibitor will not "wash out" even under driving wind and rain.

Condensation is drained off through ports in castings regardless of installation position—never allowed to accumulate around the conductors.

Designed with hot stick crews in mind.

Massive all-aluminum clamp—including hardware—may be used on aluminum or on copper conductors with inhibiting compound. Extra thick, highly conductive aluminum spacer separates dissimilar conductors for added corrosion protection.

Four clamps accommodate a wide range of wire sizes—main from 6 to 795 ACSR, tap from 8 to 397.5 ACSR. Write for samples and literature.

LIVE BETTER ELECTRICALLY

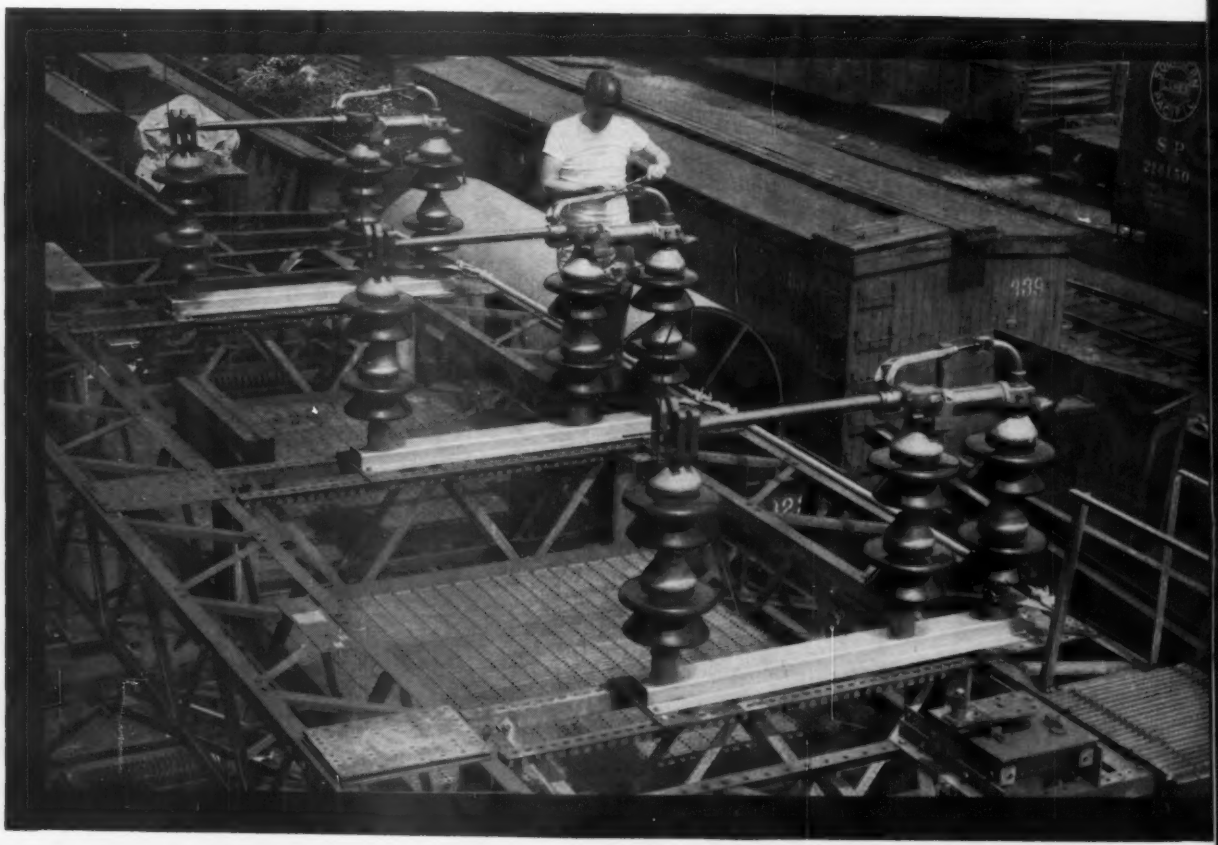
For complete information and test data: Send for Bulletin #6003

Jasper BLACKBURN Corporation

1525 Woodson Road • St. Louis 14, Mo.

For phone number of closest representative see advertising index in back of book.

NEW WESTINGHOUSE V-2 SWITCH EASIEST TO INSTALL AND OPERATE



Mounted horizontally, vertically or underslung, you'll find the new Westinghouse V-2 air break switch easiest and quickest to install and adjust . . . saves crew time. Westinghouse engineers considered all installation and alignment problems, then carefully designed them out of the V-2 while making its operation as effortless as possible. Here are some highlights of the new V-2 switch:

POSITIVE, ENCLOSED STOPS, easily adjusted during installation by accessible threaded studs, precisely regulate blade travel in any mounting position. Stops cannot malfunction even under icy conditions.

PROTECTED ADJUSTABLE SLIP JOINT in quick-access enclosure allows positive, simple, in-field positioning of blade in break jaw. Correct positioning eliminates blade motion and contact burning during fault conditions.

NEW SPLIT-TYPE ROD ENDS for interphase pipe provide easy preliminary adjustment, with piercing set screws to hold final settings.

LONG-TERM, LOW OPERATING EFFORT is assured by teflon-coated bushings on all live-side bearings. Bushings are almost frictionless, resist corrosion, never need lubrication. Mean long life, less maintenance.

In addition to these benefits, the new V-2 switch retains the unique mechanical advantages of the pioneering "V" design—such as the solid current-carrying bridging member enclosed at blade hinge, yet completely inspectable . . . universal operating lever on driven pole . . . rotating insulator bearing recessed in base . . . and the ability to operate positively and safely under adverse atmospheric conditions.

WANT MORE INFORMATION on the new Westinghouse V-2 switch? Contact your nearby Westinghouse sales engineer or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-61002-R

YOU CAN BE SURE...IF IT'S Westinghouse

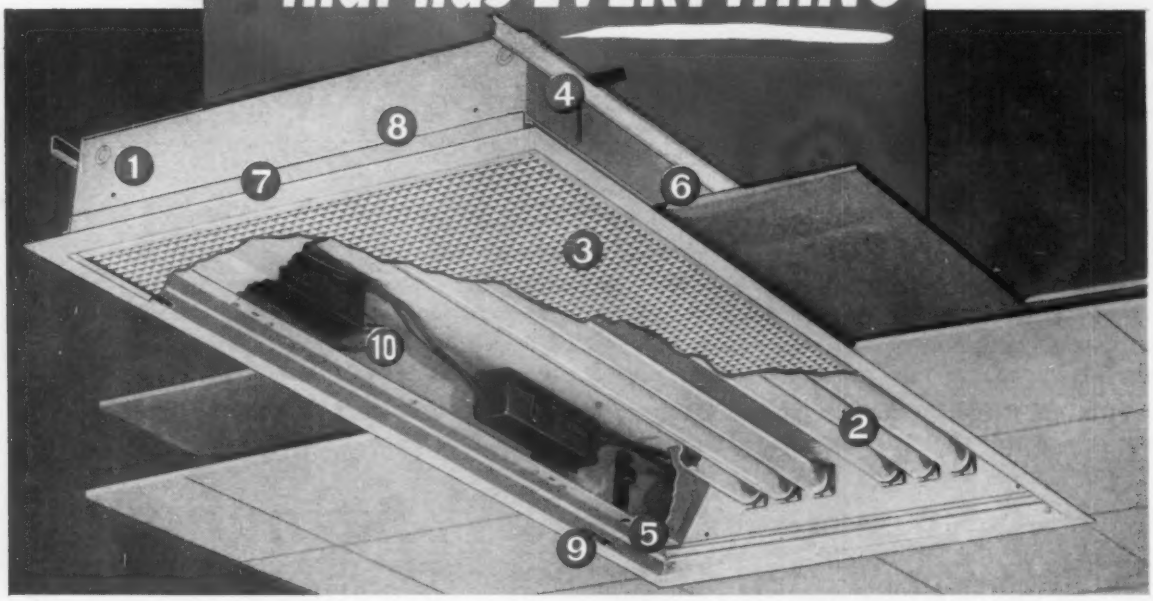
EASY PRELIMINARY ADJUSTMENT of interphase pipe is provided by new split-type rod ends. Piercing set screws hold final settings securely.

SIMPLE INSTALLATION, EASY OPERATION of the new Westinghouse V-2 switch are achieved because: (1) threaded studs adjust enclosed stops that control blade travel; (2) enclosed slip joint provides simple alignment of blade in break jaw; and (3) teflon-coated bushings on live-side bearings reduce operation friction.

MAINTENANCE IS MINIMIZED in V-2 switch by non-corrosive, teflon-coated bushings. Uncoated bushing at left is badly corroded after 1000-hour salt spray test. Coated bushing (center) is unharmed. Bushing at right, even with outside teflon coating deliberately removed, is nearly perfect, protected by teflon which penetrated metal.

CORRECT BLADE POSITIONING in the break jaw is possible with enclosed, easy-access adjustable slip joint. Adjusting nut positions blade for precise coordination with blade stop in break jaw to eliminate contact burning under fault conditions. Adjustment can be easily made in the field regardless of switch mounting position.

NOW! a Recessed Troffer that has EVERYTHING



SMOOT-HOLMAN "WILSHIRE"
2′ x 4′ LUMINAIRE

1. Only 5-in. deep. 2-ft. wide by 4-ft. long.
2. For 2, 3, 4 or 6 rapid start lamps.
3. Choice of 8 different diffusers to meet specific lighting needs.
4. Easy and fast to install . . . 4 "jacks" flip outward to support fixture on wood or metal furring.
5. Leveling screws adjusted from below. No above-the-fixture work necessary after service lines are in.
6. Ten mounting styles, tailored to fit various types of ceilings, save man-hours and money.
7. Finest of finishes: Electrostatically applied, baked-on Permalux . . . reflectance 85% or more.
8. Metal given 5-stage rust inhibiting treatment before finishing.
9. Touch-type latch for easy relamping. Entire panel easily removed without tools. (Safety hinges prevent dislodging when panel swings free.)
10. CBM certified ballasts mounted outside heat zone. Knockouts conveniently distributed, top, sides and ends.

For the Architect — clean, flush mounted . . . adaptable to various ceilings . . . versatility allows complete freedom of design.

For the Engineer — Dependable lighting performance and fixture construction.

For the Electrical Contractor — Housing shipped complete, ready for easy one-man installation.

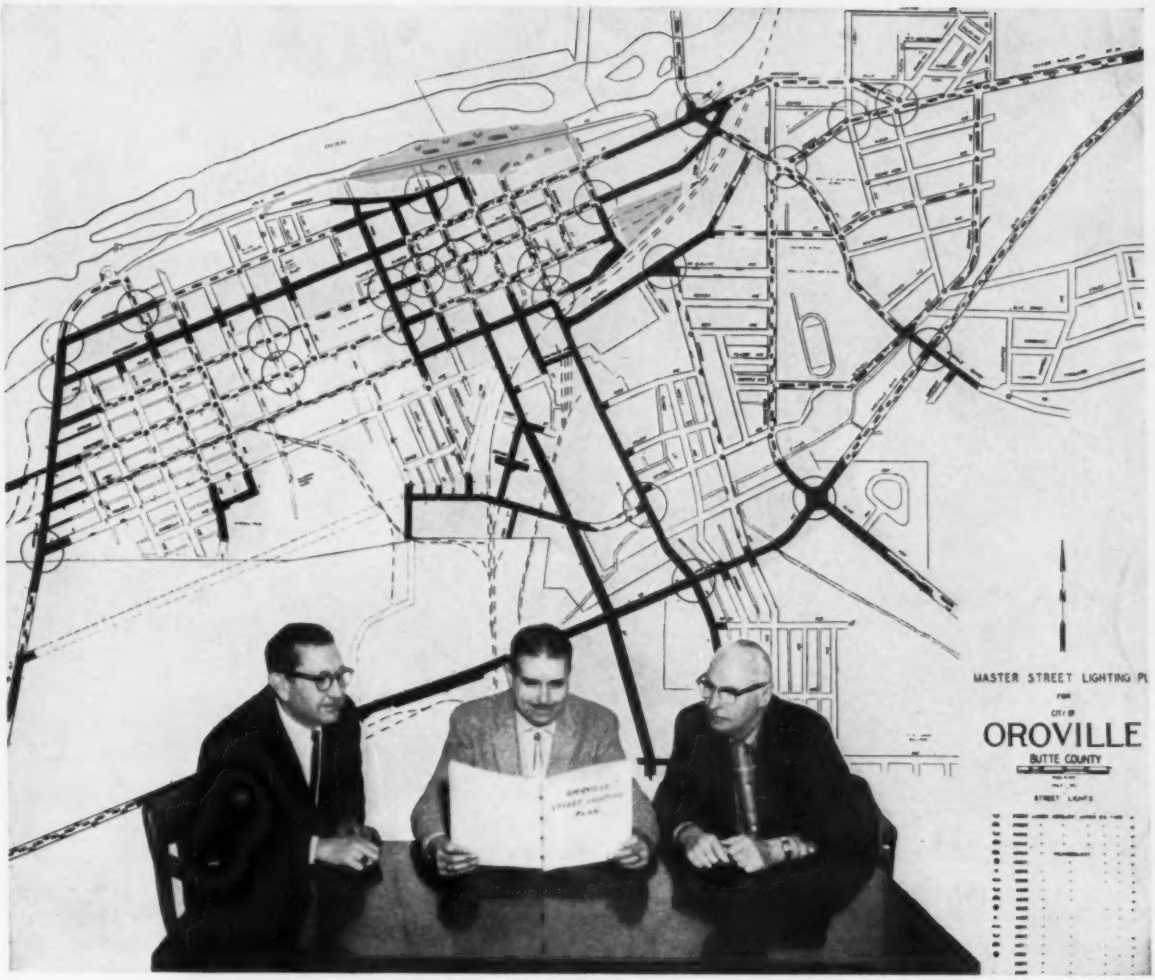
For the User-Owner — Years of trouble-free service with a minimum of maintenance expense.

Also available as "BEVERLY" 1 x 4 model • *Write for detailed information to:*

TOMORROW'S LIGHTING TODAY!

SMOOT-HOLMAN COMPANY, *Inglewood, California*

For phone number of closest representative see advertising index in back of book.



(left to right) Howard Beeler, PG&E representative; Oroville Mayor Conrad Weisker; and City Mgr. R. M. Carpenter.

Planned lighting pays in the "City of Gold"

"Downtown business, civic pride, both gain from new street lighting," says Oroville Mayor!

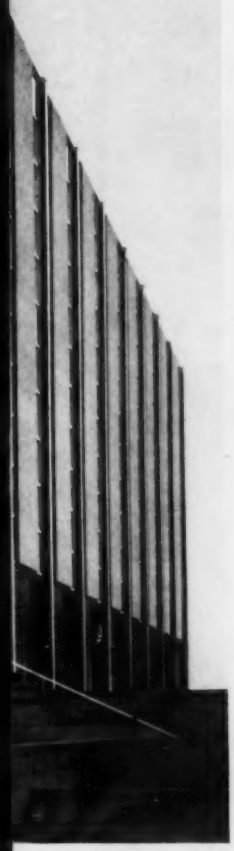
Oroville has a new look in 1960! Streets are bright, safe and friendly—thanks to a new Master Plan for street lighting. The accident rate for both drivers and pedestrians? Down! Nighttime shopping business? Up! Civic pride is bolstered... even real estate values have a way of rising in the light of good community housekeeping.

Want to bring safe, friendly streets to your town? Ask a PG&E office for a Master Street Lighting Plan. Also pick up the free booklet "Modern Street Lighting for Your Community."

P·G and E·
Pacific Gas and Electric Company

Day-Brite lighting helps make the new Pius XII Memorial Library a center of attraction on the St. Louis U. campus.

Day-Brite Troffers with Cleartex® Plastic Lens Panels deliver 73 footcandles of illumination to reading areas.



Architect and Engineer: Leo A. Daly • Electrical Contractor: Sachs Electric Corp.

How Day-Brite lighting "sells" reading in the new Pius XII Memorial Library

From the architect's first draft to the final choice of curtains, St. Louis University's modern new library was planned with one goal in mind: to encourage students to *use* it.

Self-service, open-type book shelves were used to invite "browsing" among the stacks. "Wide-open" interior design helped create a pleasant atmosphere. In addition, comfortable bright-colored furniture was contrasted against light-colored walls and a noiseless cork floor.

Lighting, of course, was a major consideration. It had to facilitate reading and, at the same time, add to the over-all cheerfulness. Day-Brite lighting was specified for high-level, high-quality illumination and clean, modern fixture design.

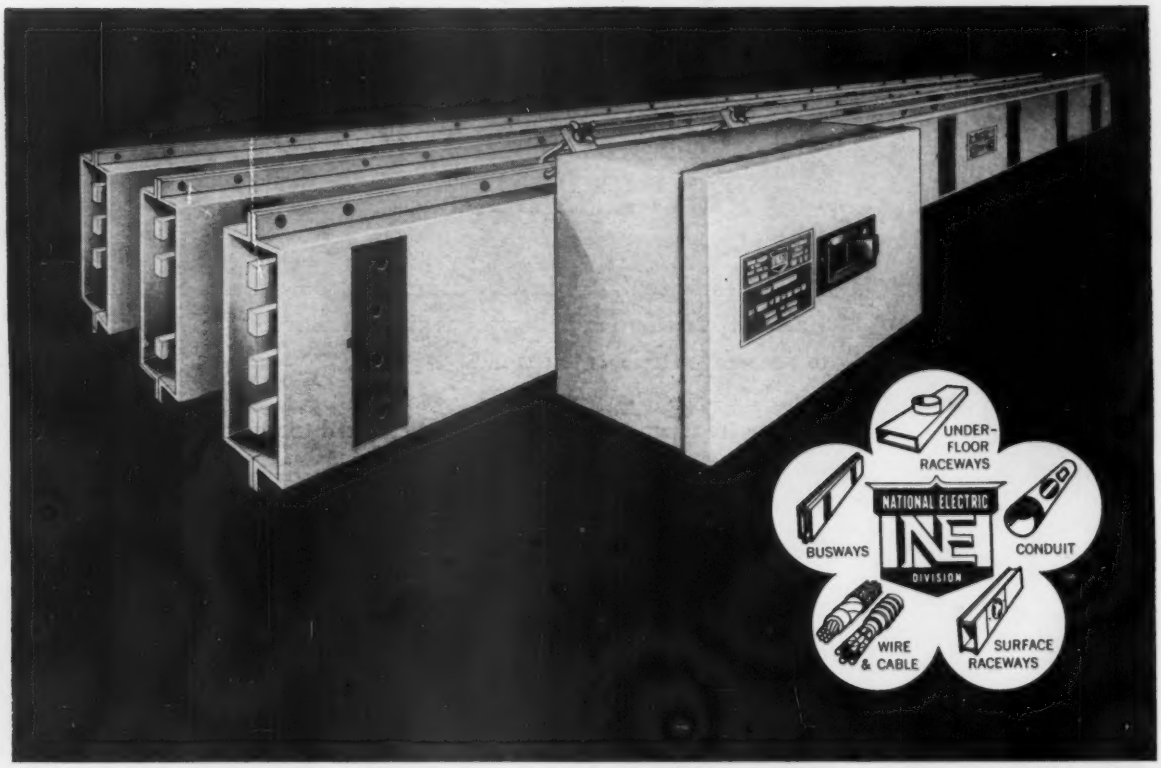
Good vision calls for good lighting. And you display good vision when you call in your Day-Brite representative early. *Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

DAY-BRITE

NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

HERE'S A NEW, BETTER METHOD OF ELECTRICAL DISTRIBUTION

N-E 100 AMP SPEEDBUS



"Speedbus," National Electric's new 100 amp busway, goes in so fast, and is priced so low that in most installations it actually is more economical to use than conduit or cable!

Never before has as compact and convenient a distribution system been made available. Never before has such wide application of busway been possible. In almost any commercial or industrial location where both power and lighting are required, this new, completely flexible, factory-assembled busway will serve best.

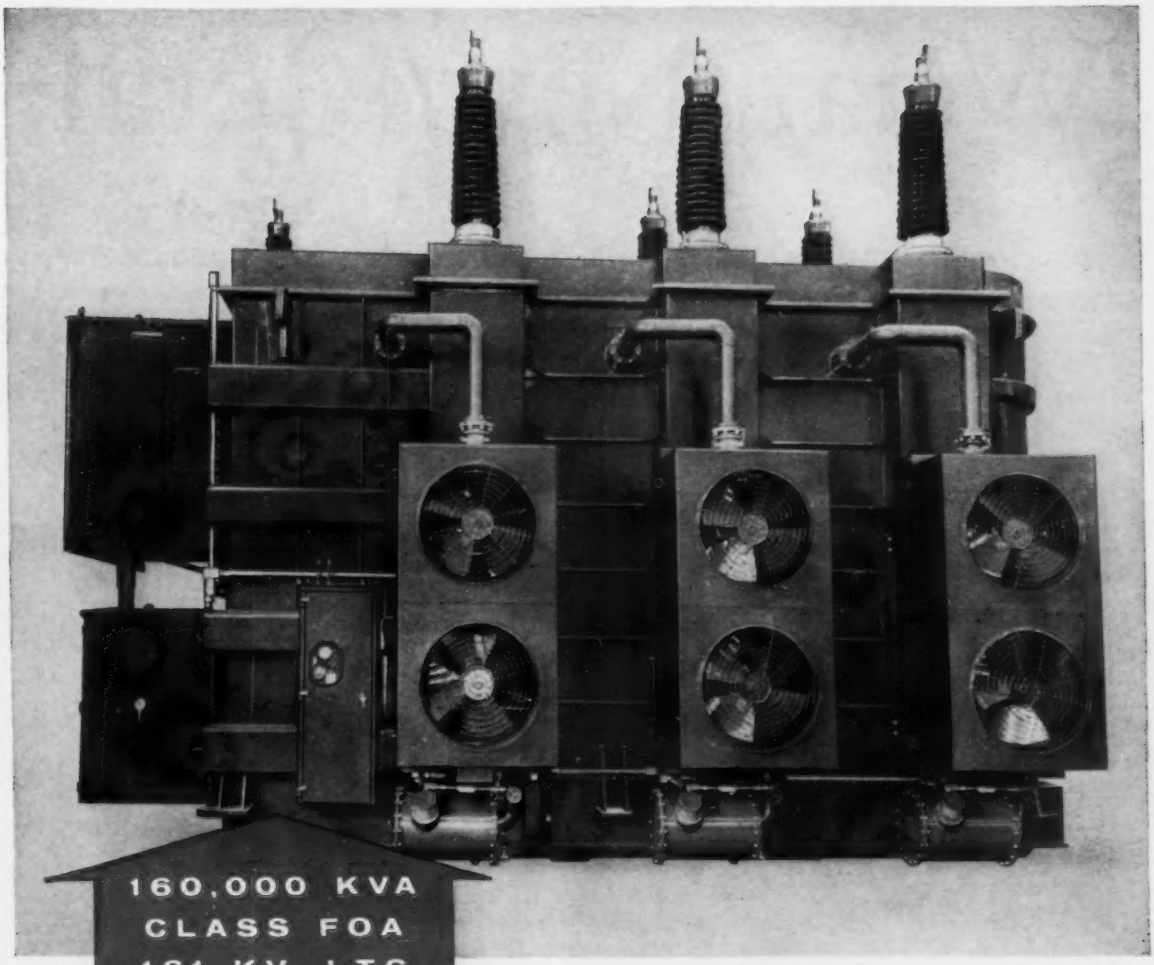
"Speedbus" can be plugged in from either side, back-to-back—16 usable outlets in every ten foot length. Bolted connections on case and conductor assure positive grounding continuity and electrical contact. Erection of "Speedbus" is simple—using only hand tools. Lightweight sections incorporating aluminum bus bars are easy to lift, and require fewer hangers.

For complete information on how to improve your electrical lighting or power distribution while saving money, call N-E Man, or write for literature. *National Electric Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

NATIONAL ELECTRIC DIVISION PORTER **H. K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For phone number of closest representative see advertising index in back of book.



Moloney combination transformer and auto transformer now in operation for a large midwestern utility. Voltage ratings are: HV 161 KV Grd. Y @ 160 MVA, LV 115 KV Grd. Y @ 118 MVA, TV 13.8 KV delta @ 42 MVA. HV and LV windings have a one step reduction in BIL. No-load taps are provided in the HV and TV windings. LTC equipment provides + or — 10% regulation at TV terminals.

This unit operates in parallel with four other transformers and meets the following three conditions of loading:

HV 160 MVA	LV 118 MVA	TV 42 MVA
HV 118 MVA	LV 118 MVA	TV Idle
HV 42 MVA	LV Idle	TV 42 MVA

The many conditions met in designing this unit are evidence of Moloney's ability to provide power transformers for every application. Specify Moloney . . . All Along The Line.

ME60-11

Since 1896... MORE POWER TO YOU

MOLONEY ELECTRIC COMPANY

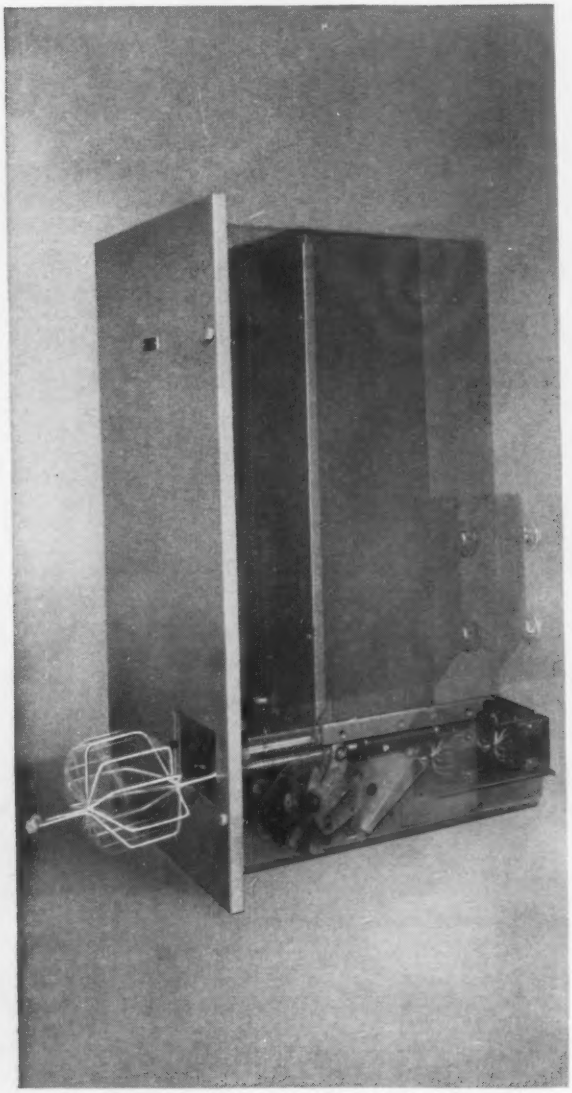
Transformers for Utilities, Industry and Electronic Applications

FACTORIES: ST. LOUIS 20, MO. • TORONTO, ONT., CANADA • SALES OFFICES IN ALL PRINCIPAL CITIES

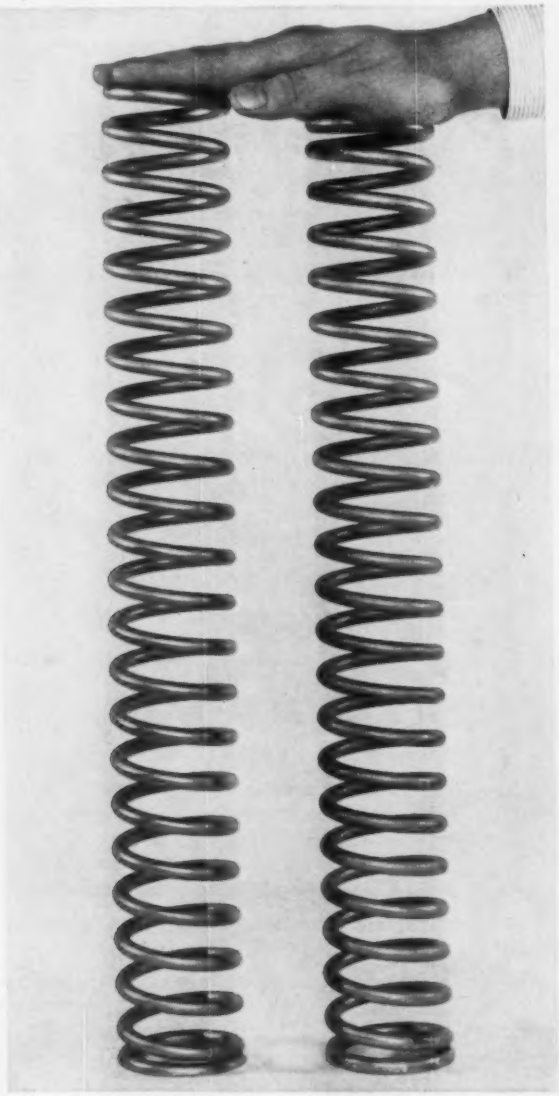
For phone number of closest representative see advertising index in back of book

What New Metal-

Has closed-door drawout . . .



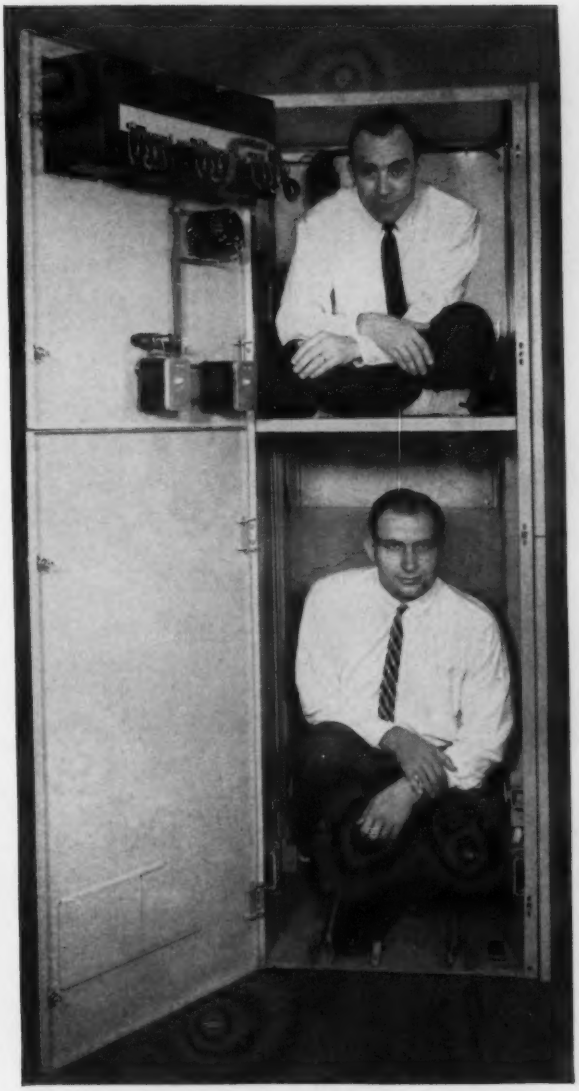
Stored energy as standard . . .



For complete answer, send for new illustrated Bulletin 2801-2A. And ask to see sound strip film that shows you every detail in only 18 minutes. Can be shown to you singly or to your group. Contact your nearby I-T-E sales office. Or write I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Phila. 30, Pa.

Clad Switchgear...

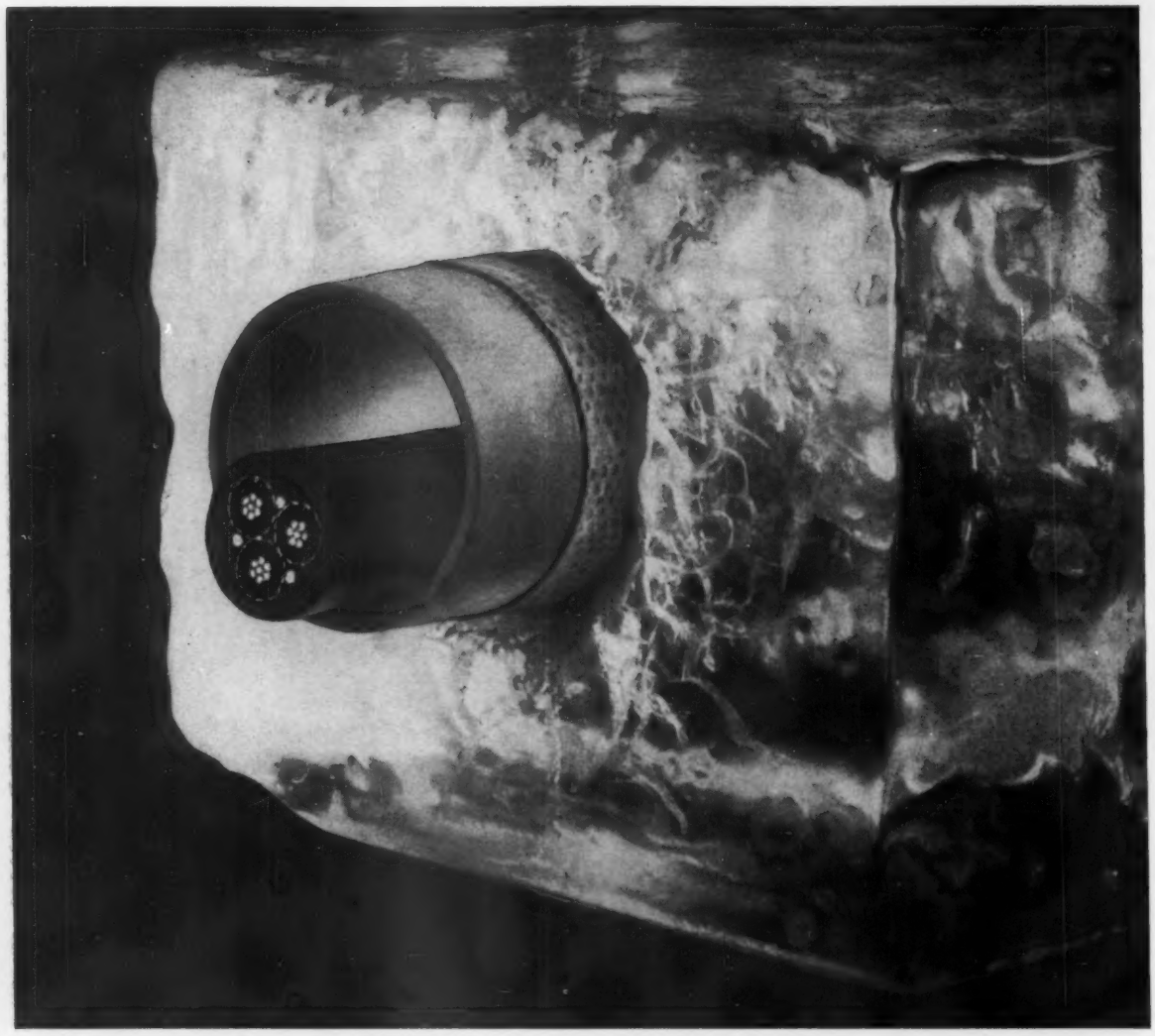
More elbow room inside...



Yet fits in tighter spaces?

I-T-E CIRCUIT BREAKER COMPANY

For phone number of closest representative see advertising index in back of book.

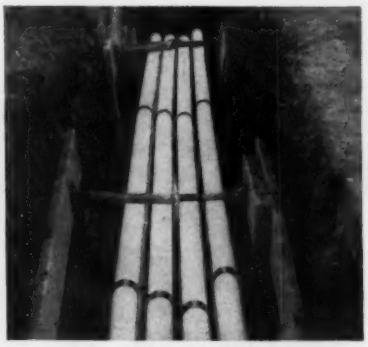


Cooler cables at lowest costs with Transite Ducts!

Do you know that electrical system losses amount to more than four hundred million dollars annually? Research shows that these losses can be drastically reduced by improving the dissipation of heat from conductors under load. The most efficient and economical way to accomplish this is with inorganic Transite® Ducts.

Tests prove that asbestos-cement Transite Ducts can actually have as much as 110.6% greater heat-carrying ability than organic ducts. This means that when a conductor is supplying a given load, its temperature will be substantially lower in Transite. These cooler cables result in lower electrical resistance with correspondingly lower I^2R losses. At a $20/KW cost, this can save you as much as $8.20 per thousand feet a year. Lower operating temperatures mean longer cable life and more reliable service, too!

Because of their 10′ lengths and speedy coupling method, Transite Ducts can be installed at the lowest cost. Get the full story by writing Johns-Manville, Box 14, EW-8. New York 16, N. Y. In Canada: Port Credit, Ontario.



JOHNS-MANVILLE

JM

General Electric reports on developments in . . . **NUCLEAR POWER**

Coming Closer: ECONOMICAL NUCLEAR POWER

FIVE YEARS AGO General Electric established its Atomic Power Equipment Department to consolidate the Company's work on commercial applications of nuclear energy. After three years of research and development, the Department set two closely related goals of interest to electric utilities:

- continued improvement of the boiling water reactor, which General Electric research had shown to be the reactor type most likely to bring economical nuclear power fastest, and at least cost
- attainment of competitive nuclear power in high-fuel-cost areas by 1965

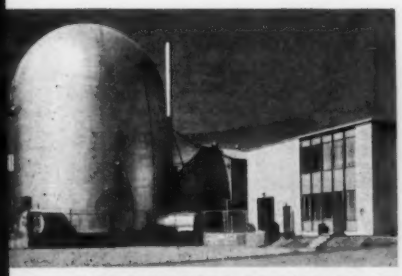
IN APRIL 1960 an important event symbolized the rapid progress made toward the first goal. Commonwealth Edison's Dresden station, the nation's largest all-nuclear power plant, produced its first power for the Chicago area. Boiling water reactor technology has been advanced considerably by design, construction, and test experience at Dresden.

DURING THE NEXT FEW YEARS a series of boiling water reactor power plants will be constructed, each making a significant contribution to the attainment of the second goal, competitive nuclear power. These plants are part of Operation Sunrise, a General Electric technical development program which has already resulted in several innovations with significant cost-cutting potential:

- **Pressure suppression,** which eliminates the need for large spherical containment vessels in some applications
- **Nuclear superheat,** which results in an improved heat rate
- **Internal steam separation,** which eliminates the need for high steam drums and extensive piping

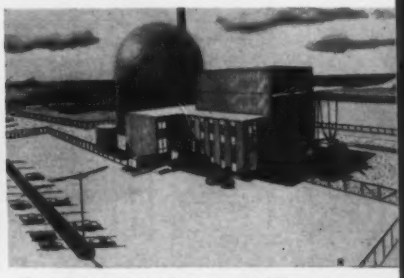
Two 50,000-kw Operation Sunrise plants will be completed by 1962—Pacific Gas & Electric Company's Humboldt Bay station and Consumers Power Company's Big Rock plant. Operating experience gained from these and other evolutionary plants, as well as from Dresden and from General Electric's Vallecitos Boiling Water Reactor, will help cut the cost of nuclear power further.

IN THE 1970'S nuclear fuel will achieve conventional status throughout the United States. The co-operation of electric utilities, the Government, and manufacturers toward this end is an indication of a progressive attitude toward technological development, an attitude which will help this country maintain its international prestige and security. For more information on Operation Sunrise, write for publication GED-3750, General Electric Company, Section 604-05, Schenectady 5, N. Y.



THE VALLECITOS BOILING WATER REACTOR is part of G.E.'s Vallecitos Atomic Laboratory, the world's largest privately owned nuclear laboratory.

COMMONWEALTH EDISON'S 180,000-kw Dresden station, the nation's largest all-nuclear power plant, began supplying power in April, 1960.



TO BE COMPLETED IN 1962, this plant of Consumers Power Company will contribute to a rapidly growing boiling water reactor technology.

GENERAL ELECTRIC

"Splayed flange" insulation for large transformers

BROWN BOVERI

By E. H. Stauffer, Project Engineer, Brown Boveri Corp.

Insulation materials of different dielectric strength have different angles of diffraction for the electric field. When layers of such dissimilar materials are used in an insulating barrier, stresses concentrate wherever angle changes occur. As a result, the dielectric strength of the insulation as a whole is much lower than for the sum of its components.

Cylinder and cap insulation

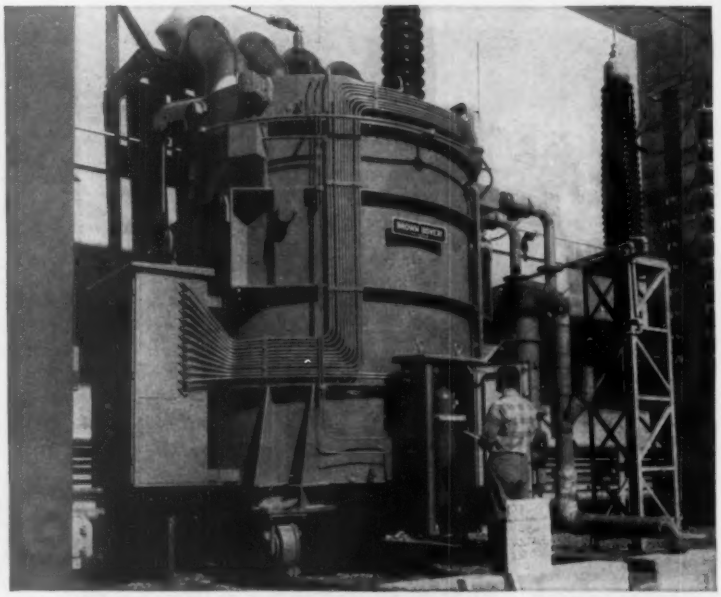
Conventional construction uses concentric bakelized or pressed paper cylinders and caps around the coils . . . with oil filling the spaces between cylinders. The electric strength of this barrier system is limited by the relatively low admissible tangential field forces along barrier surfaces and the dielectric strength of the insulation oil.

As a result, relatively large space is required between windings. This increases impedance as well as size and weight of the transformer.

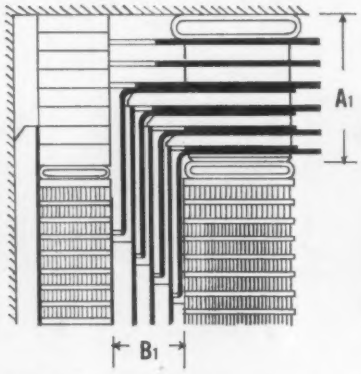
Splayed flange insulation

In all large Brown Boveri transformers, insulation between coils is a continuous wrapper of oil-impregnated paper. This homogeneous barrier, like high-voltage paper cable insulation, has substantially higher dielectric strength than conventional barrier type insulation so that space between windings is reduced . . . with obvious advantages in cost and performance.

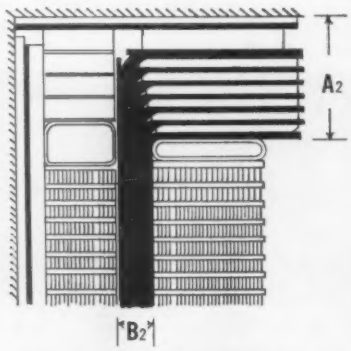
To prevent flash-over at the ends of the coils or between coil and yoke, each layer of paper is scored, bent over the top of the outer coil and splayed out to form a flange. This provides continuous insulation with no joints.



One of 13 Brown Boveri single-phase transformers with splayed flange insulation . . . at Robert Moses Dam, Massena, N.Y. All are 3-winding type equipped with forced oil-water heat exchangers and rated 86,000 kva. Six are 115-13.2/13.2 kv, six are 230-13.2/13.2 kv. The spare is reconnectable for either voltage.



Left: Section through transformer with cylinder and cap insulation. The spaces between cylinders and between cylinders and coils are filled with oil.



Right: Section showing Brown Boveri splayed flange insulation. Space is reduced between coils (B2) and between coils and yokes (A2).

Reduced size and weight

The reduction in space between coils and between coils and yokes allows substantial savings in copper, iron, oil and insulation.

Lower losses

The reduction in space between windings improves field leakage conditions and indirectly results in a smaller iron core, lower no-load losses and a smaller tank.

Hundreds of large Brown Boveri transformers totalling many million kw of capacity are in use . . . with no failures in the splayed flange insulation.

NOTE: Brown Boveri's "radially laminated core" construction is also a factor in reducing transformer size and weight and in increasing efficiency. Details available on request.

BROWN BOVERI Brown Boveri Corp., Dept. EL-8, Rector St., New York 6, N. Y. Agents in 27 U. S. cities.

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ACCESSORIES ROUNDUP

Certainly you can get Jiffy Joints in a complete range of sizes!

Has the single aluminum sleeve concept been applied to a wide range of ACSR conductors?

It certainly has! Just take a look at Jiffy Joints—our trade name for full-rated (mechanical and electrical) single-sleeve joints for ACSR conductors.

With Alcoa Jiffy Joints you can join conductors from No. 4-6/1 through 477,000 CM 18/1 as well as alloy conductors of the same diameters. All told, you can select a Jiffy Joint from our catalog 500 series, designed for any common, single-strand core ACSR conductor.

What else besides range of sizes is important? How about holding power? These aluminum Jiffy Joints properly installed will hold effectively. Laboratory tests prove they will develop 95% of the rated strength of the conductor—exactly what's expected from any full-tension joint.

Jiffy Joints install easily, too. There's no need to cut back the aluminum strands and separately join the steel core. Jiffy Joints have an internal taper at the sleeve end for easy insertion of the conductor. This is particularly important in hot-line work.

More facts: Every Jiffy Joint is prefilled with a soft filler compound, which is placed along the inner wall to allow wires to be positively inserted all the way to the center stop. This compound fills the interstices, completely sealing the compressed joint.

Spacers for EHV bundled conductors!

We've been building, testing and examining a variety of bundled conductor spacers over the past years. Out of this work has developed a closed helical spring design with oval clamps—now being installed by the New York State Power Authority on hundreds of miles of 795,000 ACSR 26/7 conductor, to be operated at 345 KV on a tie-line connecting the new Niagara and St. Lawrence Power Projects.

This spacer offers unusual strength and fatigue resistance. It provides column strength to resist short circuit forces and is flexible in all other directions.

In fact, our thorough evaluation and testing in the laboratory and field installations of a wide variety of designs lead us to believe that this is the best, so

(Continued on next page) ▸

far. This is a spacer that will stand up to all the expected installation strains.

Current consideration of three-conductor bundles has led to extension of this type of design to a novel and very efficient "tri-spacer."

Our engineers will be happy to discuss our experiences and findings with you.

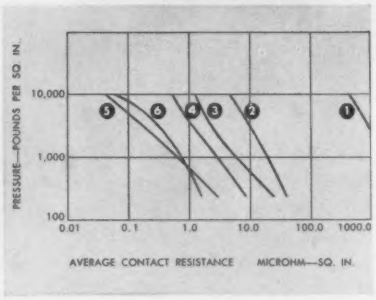
How to get low-resistance joints out of a squeeze bottle

The squeeze bottle contains Alcoa No. 2 Electrical Joint Compound, a distinctive (and patented) fluoride-containing compound that dissolves the oxide film on aluminum and seals the joint against moisture.

But there's a big difference between this and many other compounds containing fluoride. Some such compounds can result in a pitting attack of the aluminum surface, with localized action going deep into the surface. Not so with No. 2 EJC. This compound produces a light surface etch, needed for cleaning—but no deep attack. Years of use and testing lead to the following conclusions about the merits of Alcoa No. 2 EJC:

1) Lower resistance in stacks of bus conductors than with comparable joints using other compounds.
2) Stability with load cycling.
3) Efficient, trouble-free service—bus joints that are free from corrosion and low in resistance.

A performance report—six pages filled with details, charts and diagrams telling about Alcoa No. 2 Electrical Joint Compound experience and testing—is available through your Alcoa-Rome salesman.



For tests, using stacks of ¼-in. x 1-in. E.C. aluminum bus bars, the curves are as follows: (1) no treatment; (2) a metal dust in grease; (3) an inhibitor, abraded; (4) Alcoa No. 2 EJC, no abrasion; (5) Alcoa No. 2 EJC, abraded with emery; (6) silver-plated bus. Each resistance was measured across 10 interface contacts.

New clamp gripper tool

This new clamp gripper tool is for use with Alcoa Catalog 396.6 and 392.6 parallel groove clamps and a hot line "shotgun" stick. Start with the clamp positioned in the gripper with the bolt head engaged in the drive socket. End up with the clamp on the line and the gripper tool firmly held by the stick so it can't fall or get out of control. This leaves the inexpensive parallel groove clamp doing the electrical job for which it has been designed and tested. Simple. Sure. Efficient. All the steps are carefully pictured and explained in a recently issued two-page bulletin. Tell us you'd like a copy.

Reminder: Get the facts on Jiffy Joints, Spacers, No. 2 EJC and the new gripper tool —soon.

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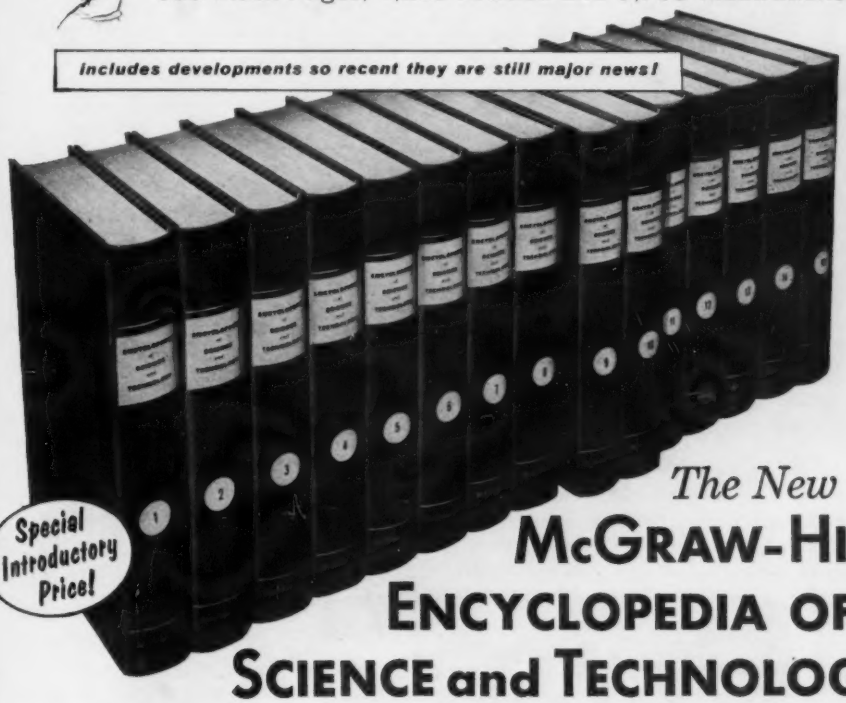

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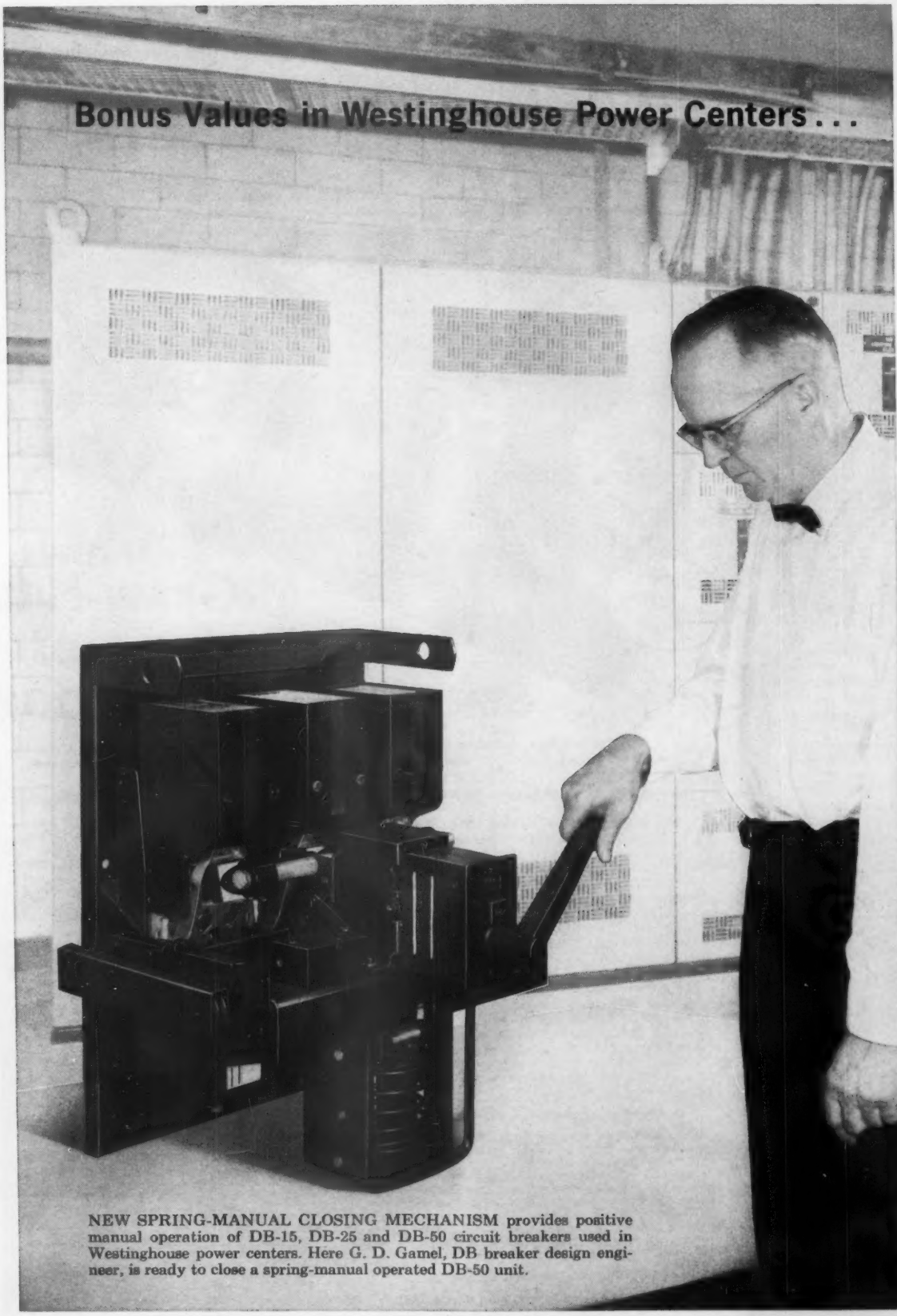


NEW SPRING-MANUAL CLOSING MECHANISM provides positive manual operation of DB-15, DB-25 and DB-50 circuit breakers used in Westinghouse power centers. Here G. D. Gamel, DB breaker design engineer, is ready to close a spring-manual operated DB-50 unit.

Westinghouse power centers offer greatest component selection . . . plus new switchgear insulation

You Can Choose the Breaker Operation You Need. Low-voltage air circuit breakers (DB-15, DB-25 and DB-50) provided in Westinghouse power centers are now available with a choice of manual, spring-manual or electric closing mechanisms. In accordance with industry standards, DB-75 and DB-100 breakers are available with an electrically operated closing mechanism only.

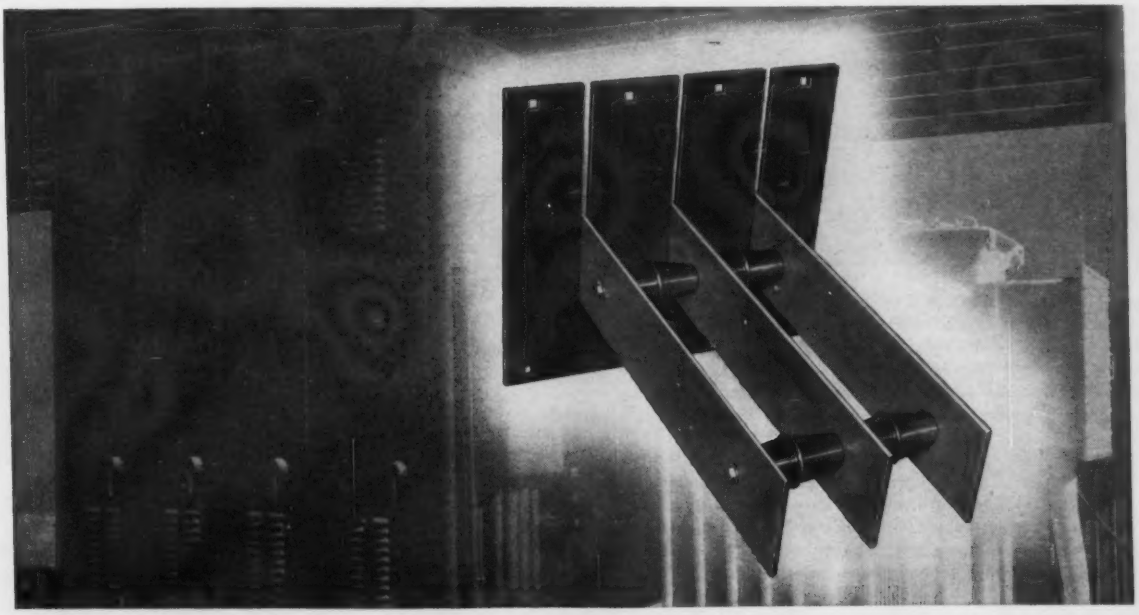
You Can Choose the Transformer You Need. As with breaker closing mechanisms above, Westinghouse gives you complete freedom of choice in selecting the power center transformer best suited to your application. Within code limitations, you can choose *oil-filled* for outdoor service . . . *Inerteen®-filled* for outdoor or indoor service where a nonflammable, liquid-cooled transformer is desirable . . . *ventilated dry-type* for maximum safety and minimum maintenance under controlled atmospheric conditions, indoors . . . and *sealed dry-type* for complete safety and virtually no maintenance, under adverse atmospheric conditions, indoors or outdoors. All dry-type transformers are equipped with low-ratio RM lightning arresters.

New Westinghouse Insulation of improved glass polyester material is used for bus supports and short circuit bracing in Westinghouse low-voltage metal-enclosed switchgear. In addition to being highly track resistant, this new insulation is also flame retardant, and the design of supports and bracing provides increased vertical creepage distances. Result is maximum safety with minimum maintenance.

These features are only a few of the continuing product improvements that provide true bonus values beyond specification in Westinghouse power centers. For complete details, call your Westinghouse representative—or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60979-R

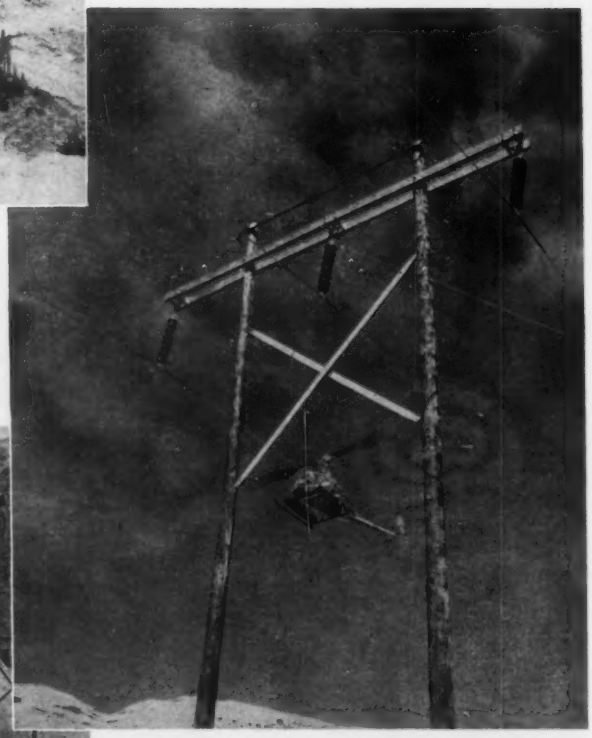
YOU CAN BE SURE...IF IT'S Westinghouse

NEW WESTINGHOUSE GLASS POLYESTER INSULATION is used for bus supports and bracing in low-voltage metal-enclosed switchgear of Westinghouse power centers.



news

Washington Water Power Co.'s Noxon Rapids Dam on the Clark Fork River in western Montana was dedicated in July in colorful ceremonies attended by officials of four Pacific Northwest states. The $87,000,000 project was started in 1956. It produces 400,000 kw. and approximately doubles the company's generating capability



Aerial inspection of Pacific Power & Light Co.'s Casper, Wyo.-to-Billings, Mont., transmission line is handled by helicopter. Here the copter is framed by a double-pole structure as it dips to check a section of the 250-mile power line

Rugged terrain of the mile-deep Snake River canyon south of Lewiston, Idaho, provided the junction point for a 103-mile, 230,000-v transmission line that will connect the Washington Water Power and Idaho Power company systems. Helicopter was used to span the 3,746-ft gap (about 5,000 ft of line) across the canyon, carrying nylon rope used to pull the cable

Total disarmament is under way at Portland General Electric Co. The firm's wartime "arsenal" is going on the auction block. Employees Joe Lee (left) and Henry Sweitzer inspect some of the shotguns and rifles to be sold. They were used by sentries guarding power plants against saboteurs in World War II

EW

Faulty Equipment Delays Priest Rapids

Construction of Priest Rapids Dam on the Columbia River, at one time 16 months ahead of schedule, may not be completed until near the contract deadline of September 1961, because of faulty equipment provided by the English Electric Co.

Grant County's contract provides a bonus arrangement for MCS of $1,300 per day per generator for early completion. If 16 months early completion were achieved, this bonus would be $4 to $5 million—probably the profit on the job.

One of five transformers failed on April 25. This has been shipped back to the English Electric factory in England and the remaining four transformers will be sent to the English Electric plant in St. Catherines, Canada, in relays, for some modification of design.

Inspection of the first transformer revealed extensive damage to the winding of one phase of the transformer, said E. B. Gibbons, manager of the Grant County PUD, the utility for which the dam is being built. Apparent cause was high induced currents in the static shield with resultant deterioration of the solid insulation between high- and low-voltage windings.

The manufacturer has offered to extend the guarantee period on these five transformers from one year to five years, and the use of a spare transformer during the extended guarantee period.

Gibbons made it clear that adoption of the "remedial plans" is the decision of the general contractor, Merritt-Chapman & Scott of New York, and that the PUD expects "all equipment, when installed, to meet all requirements of the contract documents." The general contract includes all equipment.

Trouble also has been encountered with generators, also supplied by English Electric through Merritt-Chapman & Scott. Three of the Priest Rapids generators manufactured in a Scotland plant for English Electric have shown excessive heat rise due, it is believed, to an insufficiency of stator core iron. These units will be modified at the dam site to correct the trouble. A fourth generator manufactured at the same plant has not been operated but will be modified along the same lines as the other three before being placed in service. The six units manufactured in England have met heat requirements but the air systems will be modified to bring them even further within the limits sought by the PUD, Gibbons said.

English Electric has offered to extend the guarantee period from one to two years on the four generators manufactured in the Scotland plant.

The PUD had expected that the last generating unit would be in operation by September of this year but it now appears that the last generating unit probably will not be ready until May of next year.

Valuations Up On Utility Property

Properties of all privite electric utilities operating in the state have increased in value during the past year, according to estimates of the Washington State Tax Commission. The values will be used in fixing tax rates.

The biggest increase, for $26,470,000, was credited to Puget Sound Power & Light Co. of Seattle, whose generating facilities were enlarged during the year. Puget Power properties were appraised at $152,700,000. Other increases were:

Pacific Power & Light Co., up $7.5 million to $102,500,000.

Washington Water Power Co., up $500,000 to $60 million.

Inland Power & Light Co., up $237,000 to $3,263,000.

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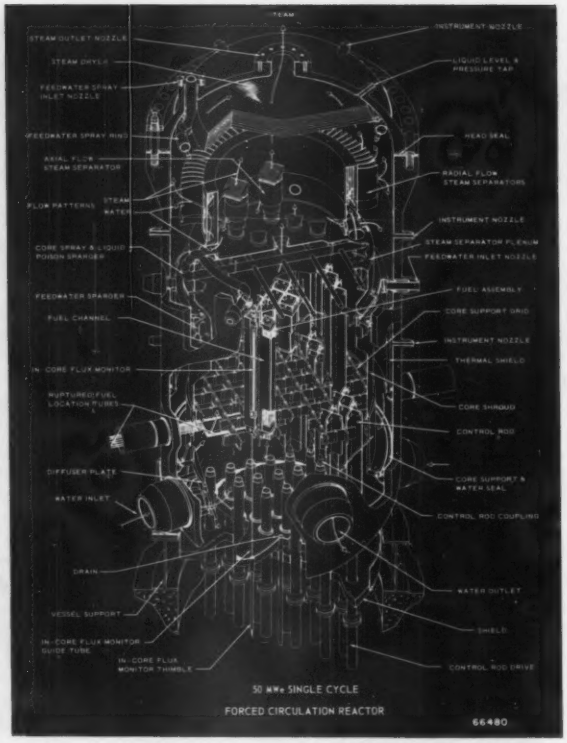
AIEE to Inspect South Bay Plant

First unit of San Diego Gas & Electric's South Bay power plant will be opened for inspection by AIEE members during the group's Pacific General meeting, Aug. 8-12. The $22 million plant will have eight units ultimately.

The power plant proper is of the outdoor-type construction, mounted on a reinforced concrete substructure. Condenser cooling water, obtained from San Diego Bay, will flow through a mile-long channel dredged in the shallow water adjacent to the plant. The warm water will be returned to the bay at a point south of the intake. To prevent recirculation, the inlet and outlet channels are separated by an earthen dyke. The condenser, furnished by Worthington, has 90,000 sq ft of surface and will require 72,000 gpm. For ultimate development the lower end of the bay must be deepened.

The Babcock & Wilcox boiler will produce 980,000 lb of steam per hour at 2,150 psig and 1,000 F. The boiler has a pressure-type furnace and can be fired with gas or fuel oil. Fuel oil for the plant will be unloaded from barges into an oil storage facility located about two miles north of the plant site proper and will be pumped to the site via a pipe line. The fuel oil depot is located on tidelands in National City. It was necessary to extend a deepwater channel to permit oil barges to tie up at the pier head. Situated on the 5½-acre oil depot site will be a 131,500-bbl oil storage tank, a pumping station and a heating plant to heat the oil before it enters the pumps. The storage tank is 140 ft in diameter and 48 ft high, and is constructed with a floating roof. The estimated cost of construction for the oil depot is $300,000.

The turbine-generator for unit No. 1 is being furnished by General Electric Co. The turbine is designed for steam conditions of 2,000 psig, 1,000 F initial temperature with reheat to 1,000 F. The generator will operate at 15,000 v and is hydrogen cooled. Construction of unit No. 2, 142-mw unit to be furnished by Westinghouse, will be started immediately after completion of unit No. 1.



Cutaway drawing shows the 50,000 kw, single cycle, forced circulation boiling water reactor selected for the AEC's prototype nuclear power plant near Los Angeles. Under the proposed arrangements for the project —which have been referred to the Joint Committee on Atomic Energy—APED would design, fabricate, construct and test operate the reactor, furnish the first fuel load, and provide operator training, all under a fixed price contract with the AEC

AEC Approves Reactor For Southern California

A joint proposal by the cities of Los Angeles and Pasadena, Calif., to build a 50,000 ekw improved cycle boiling water reactor has been approved by the AEC.

Under second-round ground rules, the municipalities will operate the reactor and provide a site for the atomic power plant and conventional turbogenerating equipment. AEC will procure and own the nuclear portion of the plant.

Steps have also been taken by AEC to secure the reactor under a $12.5 million fixed price contract from General Electric. Under current construction timetables, the advanced-type boiling water reactor should be completed by mid-1963.

Site of the proposed L.A.-Pasadena nuclear plant is an 1,100-acre tract 25 miles northwest of Los Angeles, near the town of Saugus. Ivan Bateman, chief electrical engineer of Los Angeles Department of Water & Power, gave as a reason for the large site the long-range plans of the city to install up to one million kw on the property. The 50,000 bwr would just be the first unit. The plan is, according to Bateman, to follow with 250- to 350-kw nuclear units later on. "Los Angeles now has a 2.3 million installed kw system, and its power requirements are doubling roughly every 8 to 10 years," Bateman said.

Plans are for Pasadena to take half the reactor's 50,000 kw capacity and Los Angeles the other half. The two cities have an interconnected grid, and power from the reactor will probably be fed into the Los Angeles system first, according to Bateman, before power is transmitted to Pasadena, because transmission costs can be saved this way.

Each municipality will put up $10 million. In addition, Los Angeles will provide the site and finance the conventional nonnuclear construction costs of the project.

Wage Increase

Electrical workers in the Bremerton area received a wage raise of 10¢ an hour July 1, increasing the journeymen's scale to $4.05. Another 2½¢ raise was agreed upon for next Jan. 1.

The contract was negotiated by the Bremerton division of the Puget Sound Chapter, National Electrical Contractors' Assn., with Local 574 of the Electrical Workers' Union. It provides for reduction of overtime rates on all maintenance, repair and alteration-type work on occupied residences from double time to time and a half.

A change in the contract allows a foreman to supervise more men and still remain a working foreman. Vacation pay was set at 15¢ an hour, according to Maynard Sundt, employer representative.

Dam Project for Edmonton

Alberta government will contribute $14.5 million to a dam on the Brazeau River 100 miles southwest of Edmonton, Alberta.

The dam is expected to cost a total of $45 million.

The cabinet order-in-council announcing the government contribution completes an agreement between the province and Calgary Power Ltd.

The $14.5 million will cover the cost of the project's initial storage development. Alberta will also donate the land and build access roads to the dam site.

The government is interested because the dam would help stop pollution in the North Saskatchewan River during the winter months.

Intertie Antics

The Bonneville Power Administration has received copies of two letters addressed to Sen. James E. Murray, chairman of the Committee on Interior and Insular Affairs, regarding the California intertie. The final paragraph of the letter by Secretary Seaton is, we believe, a clear statement of the fact regarding the issue.

"There appears to this department, therefore, to be no reason why fear of the consequences of sales to preference customers in California should preclude completing arrangements along the lines heretofore discussed for sales to Pacific Gas and Electric Co. Nor, in view of the preliminary findings of the consulting engineer retained by the State of California to the effect that the 230-kv line involved would not adversely affect the feasibility of the proposed higher capacity intertie, should there be any longer cause for concern that sale to PG and E would preclude consideration on the merits of the larger intertie. Sales to PG and E of dump power which will otherwise waste to the sea would result in an increase in BPA's revenues of approximately $1,800,000 per year. That additional sources of revenue are sorely needed is a fact with which I am sure you will agree. Having reviewed the matter again with the department's solicitor, we must reiterate that it is hard to find a reason for not having made the sale."

PG and E officials have reiterated their willingness to go ahead with the project once the final go-ahead is

received. Thus, the do-nothing order by Congress indicates the true political, even unrealistic, character of the so-called common carrier intertie.

Francis Pearson, chairman of the Washington State Public Service Commission, told the Washington State Grange that federal legislation should limit the Bonneville Power Administration service area to the northern California border area before any proposed Bonneville transmission intertie with California is approved.

Puget Reports on Northwest Industry

As the first report in a series on industry groups in the Pacific Northwest, the Puget Sound Power & Light Co. has published a brochure on "The Chemical Industry in the Pacific Northwest."

The report was prepared by Dr. R. W. Moulton, executive officer of the Department of Chemical Engineering at the University of Washington. It lists 29 chemical companies in the States of Washington, Oregon and Idaho and in western Montana and southwestern British Columbia.

Dr. Moulton concludes that "the demand for many chemicals in the Pacific Northwest is approaching or already exceeds quantities which justify local production" and cites Dow's proposed new phenol plant at Kalama as a prime example.

"Growth of industry basic to the region will speed construction of more small chemical plants and the integrated character of the chemical industry will probably lead to others," says the report. "Within the next few years the production of methanol from petroleum should be feasible. The production of urea could start up in the near future. Expansion in the production of synthetic ammonia is almost a certainty."

The report is a part of the program by Puget Power's area development department to attract new industry to its service area.

► Three new members in the utility group were recently welcomed by the **Inland Empire Electrical League** of Spokane. They are the Kootenai Rural Electrification Assn., Lincoln Electric Cooperative and Big Bend Electric Cooperative. Better industry-wide coordination and integration of sales promotion activities between Washington Water Power, the league and the cooperatives should result from the move.

Washington Report

Recreational Benefits Hit Snag in House

Legislation permitting up to 10% of the construction costs at federal multipurpose projects to be allocated to recreational benefits has been blocked by the House of Representatives. The Senate added the provision in the omnibus public works authorization bill for fiscal 1961.

A joint Senate-House conference on the huge $1.5 billion omnibus bill deleted the recreational benefit provision when House members said they wanted to hold hearings on it before it was approved. Under the Senate version, recreational benefits would be figured on the basis of 50¢ per tourist per day at each multipurpose project. These allocations would reduce the necessary cost of power produced at such projects and would help make more federal projects economically feasible.

Public Works Bill

Senate and House conferees will take up the public works appropriation bill for fiscal 1961 when they return from their convention recess. Both sides of the Congress have passed different versions of the bill, and conferees must iron out the $115 million difference in the two versions.

The Senate approved the higher figure: $4,030,010,605, generally making slight increases in funds for all projects approved by the House. In addition, the Senate added several projects of its own, including a $3.5 million first-year construction fund for Lower Monumental Dam in Washington. The Senate also approved $600,000 to study a project at the Bruces Eddy site, Idaho, although the House included nothing for it.

Approval Seen for Snake

The House of Representatives, when it returns to its politically charged, post-convention session this August, has a good chance of approving the controversial Burns Creek project on the Snake River, Idaho. The federal dam would cost about $50 million, have a 90,000 kw capacity, and be integrated with the existing Palisades project, just upstream from the Burns Creek site.

First-year construction funds for Burns Creek were approved by Congress last year. The Senate also approved the project's authorization bill in 1959, but the measure (S-281) was stalled in a House Interior subcommittee for many months this spring, winning approval in late June.

Lower Interest Rates for Upper Colorado Project

Lower interest rates have been assured for the construction of the federal Curecanti Dam in Colorado, after President Eisenhower last month signed into law a bill (S-1892) to change the interest formula for all remaining dams on the Upper Colorado storage project.

The interest provision was a rider —Sec. 9—in the Norman water storage project, Oklahoma.

Glen Canyon and Flaming Gorge Dam interest rates won't be affected by the measure. But they were built when interest rates under both the old and new formulas were fairly consistent. Recent high interest rates have created the disparity.

New Colorado interest formula—identical to that in the 1958 Water Storage Act—calls for construction interest rates to be based on the average of all outstanding federal long-term borrowings, maturing in 15 years or longer, at the time the construction contract is let. The old Colorado formula called for interest rates to be based on the cost of federal long-term borrowings during the month of June following the start of work on any project.

Interest on the Curecanti project is expected to drop from 4⅛% to 2⅝% as a result of the new act. This should be reflected in lower water and power rates paid by users in the Upper Colorado project.

Curecanti has been authorized for several years but construction funds are provided, for the first time, in this year's public works appropriation bill for fiscal 1961, now pending in Congress.

► The Senate Commerce committee has approved Sen. Frank Church's bill (S-2586) to prevent construction of any new dams across the Salmon River until Congress decides that adequate migratory fish passage facilities have been developed. The measure doesn't have much chance of enactment by both sides of Capitol Hill, but it is a "straw-in-the-wind" for congressional thinking on the issue of big-dams-vs-fish.

Presumably, if enacted, the bill would prevent construction of the proposed Nez Perce Dam—across the Snake River just below its confluence with the Salmon River.

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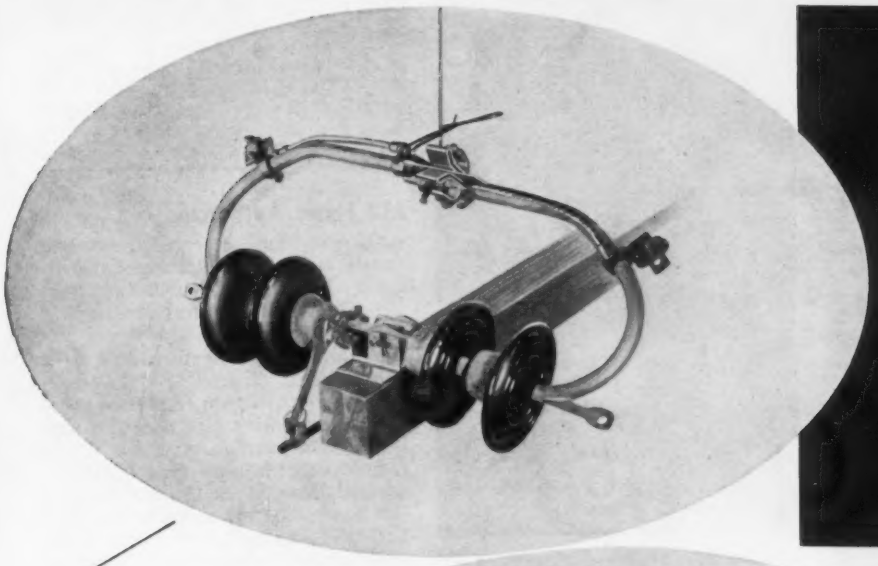

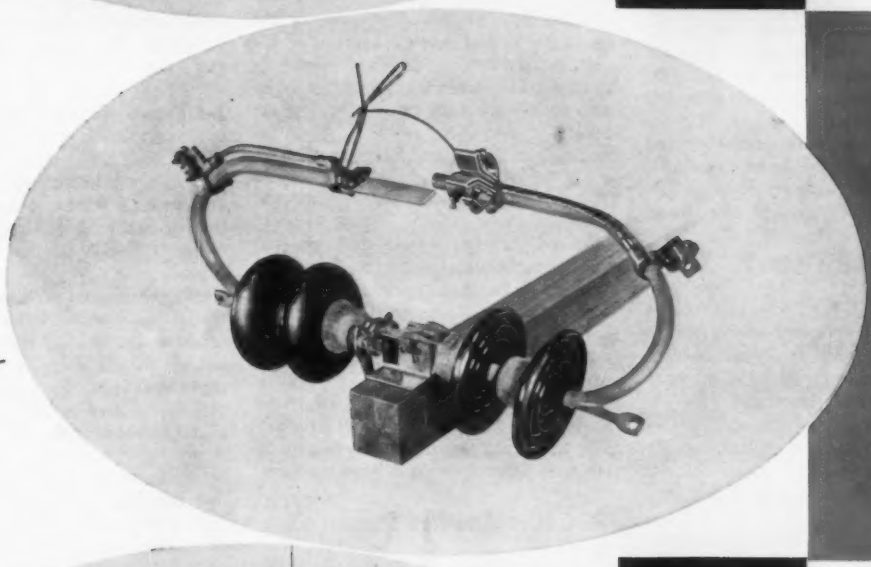

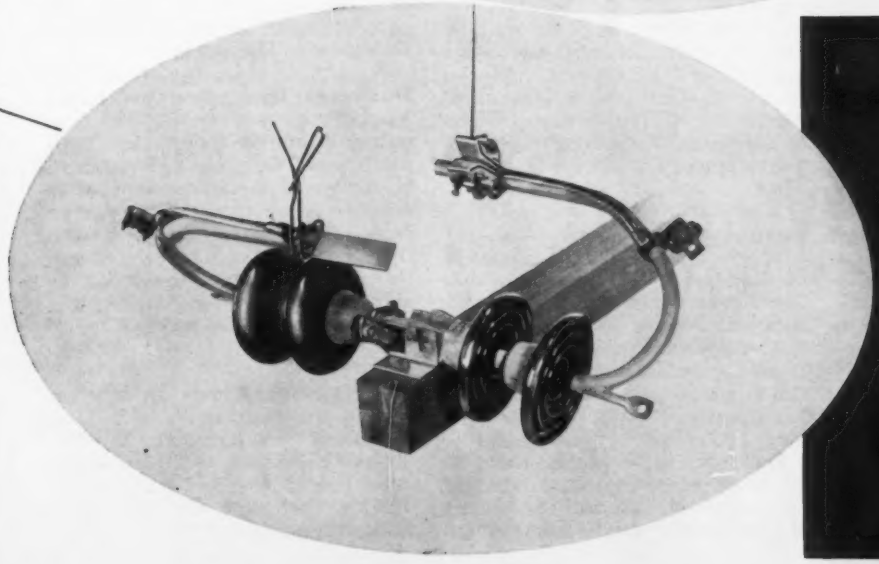

Nuclear News

Free Radicals Tested As Power Source

The newly formed Energy Conversion Laboratories of Detroit, Mich., recently announced the discovery of an entirely new method of producing electricity that utilizes the presently unused energy released by free radicals as a self-sustaining source of useful power. Free radicals, molecular fragments which possess very high energy potential, have been known to be present in chemical reactions for more than half a century.

The basic principles involved in this method and the end results have been successfully and repeatedly demonstrated by various laboratory tests. Present working models suggest the possibility of adapting this method to self-contained packaged power units that might be used as portable units in remote areas or for operating all types of vehicles, including automobiles.

No costs, type of materials used or potential size have been divulged, so an evaluation of the merits of this process is not possible at this time.

Dresden at Full Power

Commonwealth Edison Co.'s Dresden nuclear power station, the world's largest all-nuclear power plant, has demonstrated full-power operation for the first time.

This giant station, located 50 miles southwest of Chicago, is producing 180,000 kw, enough electricity to supply the needs of a city of 200,000 persons.

The $51 million station, financed entirely by private industry, was designed by General Electric Co. for Commonwealth Edison and the co-sponsoring Nuclear Power Group Inc.

Automation in the Nuclear Field

General Electric Co. has initiated what it believes to be the first production line automation in the nuclear power field, with the installation of a tape-controlled turret drill at its Atomic Power Equipment Department in San Jose, Calif.

Savings are expected to be substantial, with manufacturing time on drilling and reaming reduced considerably over previous methods. On a recent job, 17,200 perfect holes were run off in special plates for an experimental facility, in one-sixth the time required to do the same type of job by manually controlled drilling.

Stanford R. Ovshinsky, inventor of the new free radical energy conversion system, shown with a prototype unit. In background is laboratory model in operation—independent of conventional power source

In addition, automated systems are being investigated for the nuclear fuel manufacturing operation and for plant-wide quality control. General Electric production officials believe that this is the start of a trend toward automation in the nuclear field. The utilization of these more efficient methods of production will help in the achievement of the goal of economic nuclear power.

PRDC Hits Another Snag

The U. S. Court of Appeals for the District of Columbia last month voided the AEC's provisional construction permit for the $88 million Enrico Fermi fast breeder reactor being built by the Power Reactor Development Co. at Lagoona Beach, Mich.

The court decided that the AEC's practice of issuing provisional construction permits and the approval of the location of a reactor within 30 miles of a metropolitan area violated the Atomic Energy Act.

The government has asked for a rehearing before the full court on this matter. In the event of a denial an appeal to the Supreme Court is likely.

If a rehearing is not granted PRDC must cease work on the nuclear portion of its plant and the holders of construction permits for other nuclear projects will have the possibility of a similar situation facing them.

If this order stands the civilian nuclear program will have suffered one of its worst setbacks.

Growth

REA Loans Authorized

Oregon: Eastern Oregon Electric Cooperative, Pendleton, $355,000 to finance 47 miles of distribution line, 12 miles of 69-kv transmission line and a 1,500-kva substation.

Washington: Mutual Power & Light Assn., Tanner, $192,000 to finance construction of 34 miles of distribution line, some of which will be submarine cable.

Colorado: Poudre Valley Rural Electric Assn., Fort Collins, $1,155,000 to finance 202 miles of distribution line, 25 miles of 69-kv transmission line, substations at Wellington and Flat Iron, and 20 miles of tie line.

► **Teton Valley Power & Milling** Co. proposed the sale of electric generating and transmission facilities located in Idaho and Wyoming to the **Fall River Rural Electric Co-op.** of Ashton, Idaho, for purchase price of $537,000.

► **Washington Water Power** has under way a $500,000 30-kv distribution line which **will bring system power to Elk City,** a colorful Idaho frontier town. Present power facilities in the city are privately operated generating plants.

► **Lincoln Service** Corp. of Frontier has been authorized by the Wyoming PSC to build facilities to provide electrical service to Food Machinery Corp.'s industrial coke plant southwest of Kemmerer.

► **Hoover Dam power generation** has been restored to 100% of firm output beginning June 1, 1960. This decision will be reviewed by Bureau of Reclamation and power-allottee officials at another meeting to be held in Los Angeles Sept. 14 when the spring and summer runoff will be reviewed. At that time it will be decided whether to continue the 100% output or to make a reduction.

► FPC has approved an application by the **Eugene Water & Electric Board** to increase the capacity of its **Carmen-Smith hydroelectric** development from 53,500 kw to 90,000 kw, increasing the price from $19 to $25 million.

Communications

► **"FAST" SLOW SCAN TV** system recently developed by RCA to permit viewing of sun spots from a telescope could prove to be a boon to electric utilities where relatively slow motion is to be viewed. It produces one frame a second with 500 line resolution — *better resolution than the home TV sets attain.* Bandwidth is 200 kc. Since many industrial microwave systems currently in use cannot handle full video circuits, this system will offer them an opportunity to use TV for reading many types of meters.

► **NCUR** held its annual meeting June 15-17 in St. Petersburg, Fla. Representatives were present from the 10 regional sponsor organizations and seven trade associations of the power utility industry. Chairman for 1960-61 will be Earl Glatzel of Detroit Edison Co.; vice-chairman, Harold Backen Jr. of the Douglas Electric Cooperative, Roseburg, Ore., representing the National Rural Electric Cooperative Assn.; and secretary, Clarence O. Diller of the Lone Star Gas Co. As it has for the past several years, microwave docket 11866 received considerable attention. The relatively new docket 12940 pertaining to termination and interconnection of private and common carrier facilities also received comment. These two dockets are further manifestations of the Bell System's tardy attempts to close the door on the use of private communications systems — now that equipment is available for general use at better than competitive prices.

► **APPARENTLY SWEDISH ENGINEERS** share American electric utility engineers' feelings with regard to responsibility for communications channels as they say: "The circuits are considered so important for the reliability of the remote control system and are so closely associated with the other equipment in the system that the maintenance of the circuits must be undertaken by the personnel within the power company. Consequently, lines from the public telephone system are not usually rented for the purpose."

► **A MOST ASTONISHING EXPERIMENTAL MEANS** of transmitting TV signals has been tried between two power plants. The video is applied to a 300-mc radio link beamed down river with a high mountain blocking any line of sight path between the two points. Apparently the system actually operates from reflections along the river bank, but not in a satisfactory manner. Future plans call for a 6,000-mc microwave channel and reflector.

► **"MOBOTS"** may shortly be walking around your nuclear power plant if Hughes Aircraft receives an o.k. from the FCC for its recent application for frequencies above 13,000 mc to control the creature. It has applied for 100 mc of space for control of a vehicle that can be used to manipulate tools, etc., where the environment precludes human occupation. We now have all of the components necessary to produce such a device, only an integration is needed to produce it. Should science fiction writers be hailed as prophets?

► **ADDITIONAL RADIO FREQUENCIES** have been requested by NCUR in a petition filed with the FCC. This organization has been very conservative in its estimates of radio usage, and it now appears that increased applications may well make the frequency space available too small. The new petition takes cognizance of the shift toward higher frequencies and refers specifically to 152- and 450-mc bands.

Market Development

Hilo Electric Shows Its Greatest Assets

In the wake of the disastrous tidal wave that swept over the Island of Hawaii, Hilo Electric Light Co. has launched a new local public relations campaign with a "business as usual" approach.

Eight 100-in. advertisements in the Hilo *Tribune-Herald* spearhead the campaign. Each features an employee from a different job category at HELCO. Although the company suffered heavy damages from the tidal wave, it is not using the ad campaign to recite its losses. It is concentrating on the company's greatest asset—a dedicated and community-minded group of employees. Actually, preparation of this campaign under the theme "Electric muscle builds a better Big Island" was started in early spring. Its purpose then was two-fold: to publicize the range of company services available, from cooking classes to complete wiring plans; and to "humanize" the company from the customer's point of view by showing the organization as a collection of his friends, neighbors and business associates.

In the reconstruction wake of the tidal wave, public understanding of HELCO's operation became vital. All utility companies in a disaster area have faced the misunderstandings that arise concerning the resumption of service and when emergency service crews will reach certain areas. Public understanding of the workings of the company and realization that everyone in the organization is doing his or her best to restore "normalcy" are essential.

HELCO General Manager William MacKenzie and Administrative Assistant D. W. Rose decided to initiate the ad insertions now to emphasize the return to normalcy.

Each advertisement shows the employee in a work situation. Among those appearing so are William H. Hill, president of HELCO and of the Hawaii State Senate, Kaiva Tuiasosopo, watch engineer at Waiakea power plant, Bunny Brown, line construction foreman. Pictures were taken by one of Hawaii's leading photographers, Robert Wenkam, whose past record includes several *Life* magazine covers.

PP&L Looks Ahead On 50th Birthday

Research adapting electricity to new uses will provide the average family more conveniences and comforts in the next decade than were invented in the past half-century, PP&L President Don R. McClung predicted in noting the company's 50th anniversary. He said the pace of research is accelerating the rapid development of new appliances for adaption of larger amounts of electricity to more and more household tasks.

Pacific Power was founded June 16, 1910. Now one of the region's largest industries, employing about 2,600 people, the company had only 17,000 customers in Oregon and Washington in its first year. Today it serves 326,000 in five states.

"Households of 1910 used an average of 200 kwh a year and paid 15 to 20¢ per kilowatt-hour," McClung reported. "Today the average household on the PP&L system uses about 8,000 kwh annually and the cost to the consumer has been reduced to a little more than 1¢ a kilowatt-hour," he said.

R. W. Gillette, assistant manager of the Grant County PUD, welcomes audience to all-electric patio party show at Ephrata, Wash.

Patio Parties Bring Out 600

A series of "All Electric Patio Party Shows" sponsored by the Grant County Public Utility District during the last part of June drew good crowds in five Columbia basin towns and PUD officials termed it an outstanding success.

The shows were planned by Mrs. Helen Jorgensen, district home economist, to demonstrate outdoor electric cooking, equipment and lighting.

A standing-room-only crowd packed the PUD auditorium at Ephrata for the opening night of the show. Many stayed to inspect the patio appliance display.

Lighting, patio equipment and barbecues were displayed on the stage, electrical appliances in the lobby. The evening presentations were at Ephrata, Quincy, Moses Lake, Coulee City and Warden. Combined attendance for the five shows was almost 600.

Mrs. Helen Jorgensen, Grant PUD home economist, and Herb Jenkins, public relations advisor, put on skit to stress advantages of electric barbecuing

Air Conditioning Market Discussed at Vancouver

Householders in coastal areas of British Columbia, Washington and Oregon are not uncomfortable enough in summer to form a large domestic air conditioning market but there is a big potential in the interior. Commercial air conditioning can be sold both on the coast and in the interior. This was the consensus at an informal discussion during the recent Vancouver, B. C., convention of the Heating, Refrigerating and Air Conditioning Engineers.

It was pointed out that in many areas in the United States the summer is becoming a peak load period for the electric utilities as the trend toward air conditioning expands, and that lower rates are being offered for winter utilization of such equipment as the heat pump. Installations with cooling as their primary object, however, are not likely to find a heavy domestic market in the Pacific Northwest coastal areas, it is believed.

Climate of interior B. C. and the Northwestern states opens up a big potential market for domestic installations but in B. C. this is shadowed by the fact that about 60% of the population of the province live in the coastal area.

In the commercial field, however, architectural trend is toward sealed windows, making air conditioning an essential.

Associations

IAEI Readies Program

Real work sessions and a program of speakers on timely and sometimes controversial subjects are promised those who attend the Southwestern Section, International Association of Electrical Inspectors, 1960 annual meeting at the Mapes Hotel, Reno, Sept. 19-22. Then when day's work is done entertainment features of the resort city will contribute to the entertainment program, according to Ernest Nelson, San Leandro chief electrical inspector, Southwestern Section president, and Lou La Fehr, Alhambra city inspector, secretary-treasurer.

La Fehr is handling the general chairmanship of the annual conference himself and will be assisted by Clyde L. Smith, secretary-treasurer of the Central California Chapter, as registration chairman. Tom Regas and Bob Germann of BullDog Electric Products will handle the displays and advertising, which are always a side show feature of the meetings.

Fluorescent fixture ballast protection, a hot subject these days, will be a feature of the program as G. E. Pieper, product specialist on ballast protection, Metals & Controls Division of Texas Instruments Inc., tells of inherent thermostat protection devices. A. E. Rowe, ballast sales engineer, General Electric Co., Los Angeles, will discuss the fuse applications for ballast protection, and a session of questions and answers as well as demonstrations are expected.

For the men's luncheon K. W. Swain, chief engineer, Chase-Shawmut Co., will speak on "You, Too, Can Be a Short Circuit Expert."

A speaker on public relations is to be another feature. H. H. Watson, commercial engineer, General Electric Co., Bridgeport, will give an NFPA report on mobile homes and trailers and their electrical requirements.

There will be nine Code Shop work sessions divided as usual into residential, commercial and industrial. A. P. Vesco, section vice-president, San Diego, is general code work shop chairman and will be assisted by L. O. Trim, A. W. Pollock, Robert Fassbender, Clyde Narvaez, R. D. Johansen and Charles R. Pierce. With previous experience in running code work shops, the results from these down-to-earth sessions are expected to be even better than

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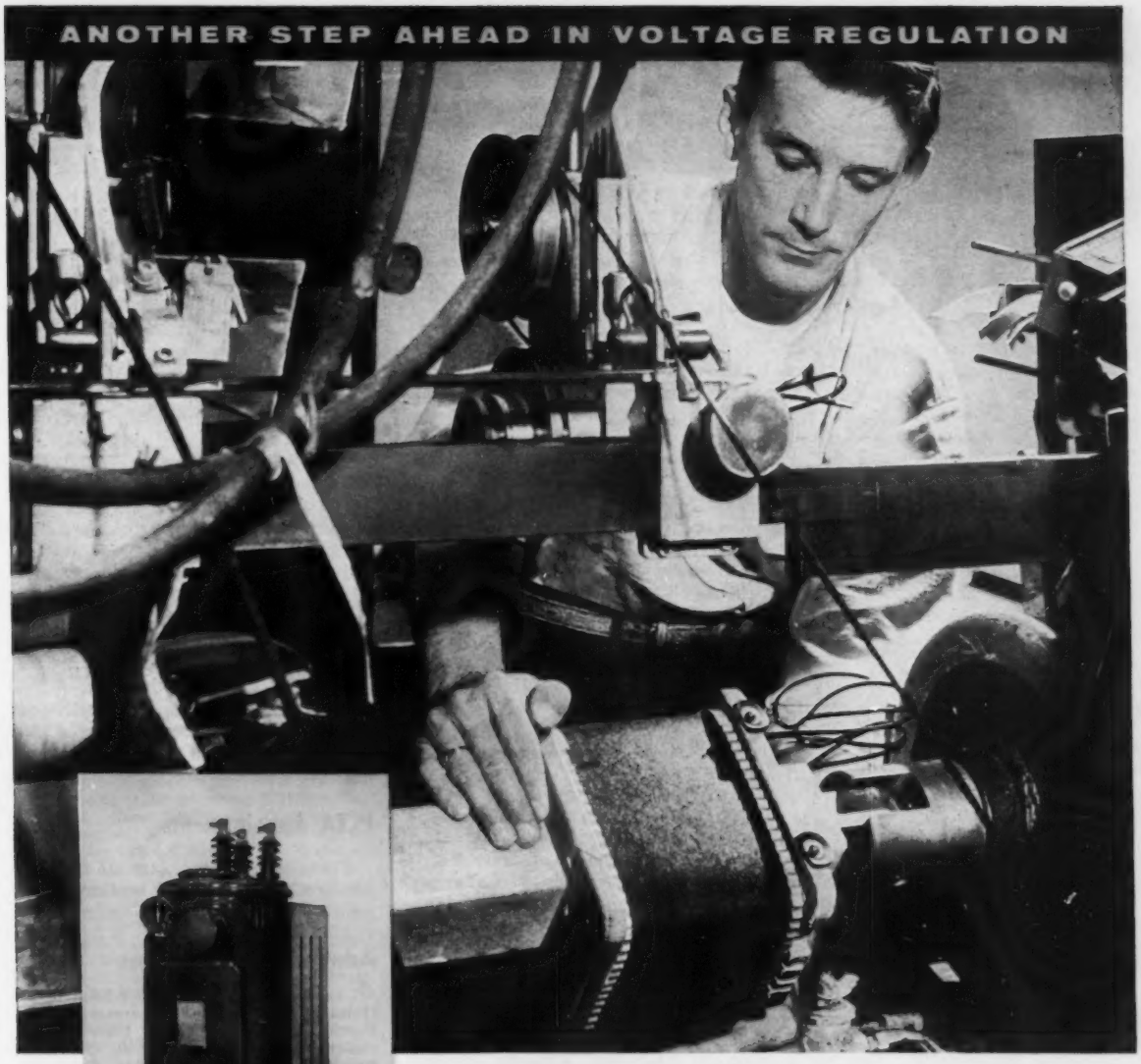

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Permalex* coil insulation in General Electric voltage regulators boosts reliability—lengthens regulator life

New Permalex insulation—another regulator first from General Electric—is now standard on all G-E ML-32 single-phase, step voltage regulators. Permalex makes possible added regulator economies through longer core and coil life and greater reliability—at no price premium.

Permalex insulation preserves high dielectric strength because of the special cyanoethylation of its kraft insulation paper. This process, exclusive with General Electric, retards formation of moisture released by cellulose materials under load—slows aging process of insulation to give you longer regulator life. Permalex insulation is fully compatible with other regulator components and provides a true *system* approach to regulator design.

Another outstanding G-E regulator feature which increases quality, Permalex insulation gives you more regulator for your money. It is, in fact, another reason why *G-E regulators cost less on the line.*

Ask your General Electric regulator representative for more information about Permalex-insulated ML-32 regulators—as well as the entire line of G-E voltage regulators. Or, write to Section 456-03, General Electric Company, Schenectady 5, N. Y.

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previous ones. The entire day of Wednesday will be devoted to a general code session where proposals authorized by the section will come from the meeting. Such proposals will be processed through a new committee appointed by President Nelson and headed by E. E. Carlton as chairman. They have been charged with putting the code proposals into proper format and language and preparing sufficient supporting comment to facilitate clearance through the executive council of IAEI.

Ladies' entertainment will include a tour to Virginia City and the evening banquet programs will be held in the Sky Room at the Mapes Hotel and other entertainment spots. Comdr. B. R. Van Buskirk, U. S. Navy, Retired, is scheduled to address the banquet under the topic "Laughing With a Prisoner of War."

The Northwestern Section's program will be sparked by the inimitable Sam Rosch of Anaconda Wire & Cable Corp. according to William Gaffney, secretary-treasurer. There will also be the two sides of the ballast heating solution problem presented by George E. Pieper of Metals & Controls and by R. R. Harlow of General Electric Co. R. W. Bell, chief electrical inspector for the State of Washington is also featured.

Meetings will be held at the Sheraton-Portland Hotel, Sept. 12-14 and entertainment of the ladies will include a luncheon at Marelco Ranch. The group will be guests of Multnomah Kennel Club on Monday night.

EMEA

Electrical Maintenance Engineers Assn. of California installed its 1960-61 officers at a gala entertainment and ladies night program July 22 at Rodger Young Auditorium, Los Angeles. Oswald D. Land, Bay Cities Floodlight & Electric Co. and last year editor of the EMEA "High Voltage," was named president by the executive committee following the election on June 22. Urban Beh, consulting lighting engineer, was named first vice-president; Lloyd A. Gates, Department of Water & Power, second vice-president; and William R. Paluska of Albert C. Martin & Associates, secretary-treasurer.

At the election of executive committee members, those named to serve for the next three years are Richard B. Hatfield, Southern California Edison Co.; John Horsburgh, Kaiser Steel Corp.; Norman E. Stone, as active members; and King D. Christopher, Clark Controller Co., sponsoring member; Robert R. Procter, Larsen-Hogue Electric Co., associate member for a two-year term; K. Lee Alvey, Airesearch Mfg. Co., active member; and William A. Rinehart, Burton Equipment Co. Inc., associate member, both for a one-year term.

Retiring as members of the executive committee were Charles M. Tabor, Larsen-Hogue Electric Co., the past president; Paul H. Henrichs, Southern California Edison Co., first vice-president; Frank R. Tharp, Floodlight & Fluorescent Maintenance Co., second vice-president; and Frank S. Miller, Robertshaw-Fulton Controls.

Area general chairmen appointed were: Walter H. Wolf, Zamboni Electric Inc., for the Harbor area; Harry M. Wallace, Westinghouse Electric Corp., for the "Old Baldy" or Pomona area; Morey Sherwin, Magnavox Research Laboratories, the San Fernando Valley area; Floyd J. McNeill, Western California Canners, Contra Costa County area; and Donald Higgins, American Potash & Chemical Corp., the Mojave Desert area.

NISA

A quick switch from Denver to San Francisco for the next national convention of National Industrial Service Assn. was made last month when accommodations for the expected 1,500 to 1,800 attendance could not be guaranteed in Denver. Immediately J. M. Harrington, executive vice-president of NISA, St. Louis, and Ken B. Mitchell, his assistant, flew to San Francisco, which was scheduled to have the convention in 1962, and arranged to skip a year. The Jack Tar Hotel was selected as headquarters because of its meeting place facilities and several other hotels and motels in the city will be blocking off numbers of rooms for the delegates from all over the United States and Canada.

By April 1, 1961, the association will have a new name, Electrical Apparatus Service Assn. (formerly NISA), and the convention in San Francisco June 4-7 will be under the new name.

A special meeting of the Northern California Chapter was held July 8 to set up preliminary procedure. Al Dutil, chairman of the chapter, Enterprise Electric Co., and Secretary-treasurer Parry Wood, Kuchel & Sievers, called a special meeting.

Payment of expenses for the convention as well as most of the arrangements will be made from headquarters but a general chairman, Jack Van Alstyne of Van Alstyne & Son in Sacramento, was selected as local general chairman. He will head a group of local committees handling some of the details.

Whether a projected regional meeting would be held anyway was debated. It was decided to hold such a meeting Oct. 1, 1960, at the Jack Tar Hotel. Van Alstyne is also its chairman and George Ekmeir co-chairman for the one-day affair. More technical and less business subjects were asked for by some of the members at the meeting. It will be a regional meeting for all chapters in California with a program in the morning, shop visitation in the afternoon and a dinner that evening. Some 40 are expected to attend.

Harrington also announced that traveling seminars on technical subjects conducted by A. C. Roe, technical expert for NISA-EASA, and a series of management seminars of three-day duration will be conducted throughout the country.

British Columbia Chapter of NISA-EASA will play host to the Pacific Northwest conference at the Grosvenor Hotel, Vancouver, B. C., Oct. 21, according to Charles E. Longley. That meeting will be for the British Columbia, Puget Sound and Oregon Chapters.

PCEA Appointments

President H. F. Hartzell has announced the following section chairmen and committee appointments:

Administrative Services

GUIDANCE COMMITTEE—W. T. Quinzler, *Arizona PS, chairman;* D. M. Pritchett, *California Pacific Utilities, vice-chairman;* L. C. Jantz, *Calectric, sponsor of Purchasing & Stores Group;* H. Tracy, *So. Calif. Ed., sponsor of Building Design & Maintenance;* Don Bell, *PG and E,* Ed Cuerdon, *Arizona PS, co-sponsors, Economics of the Utility Business.*

ADVISORY COMMITTEE—R. W. White, *PG and E;* E. V. Kruger, *So. Calif. Ed.;* W. N. Fairlee, *PG and E;* J. A. Talley, *Calectric;* F. W. Mielke Jr., *PG and E.*

Business Development

GUIDANCE COMMITTEE — Frank M. Falge, *G-E, chairman;* Ralph J. Phillips, *San Diego G&E, vice-chairman—residential;* Walter D. Howell, *PG and E, vice-chairman—commercial-industrial and agricultural;* O. R. Doerr, *PG and E;* B. E. Lowe, *Sierra Pacific Power;* T. M. McDaniel Jr., *So. Calif. Ed.;* Don Willis, *Arizona PS.*

ADVISORY COMMITTEE — Gordon F. Black, *Rome Cable Div., Alcoa;* D. C. Aiken, *PG and E;* J. A. Corlett, *G-E;* J. C. Chamberlain, *Bureau of Home Appliances, San Diego;* Jack Kiedaisch, *Arizona PS.*

AGRICULTURAL ELECTRIFICATION COMMITTEE—R. L. Saling, *Westinghouse, chairman;* F. H. Coover, *So. Calif. Ed., vice-chairman.*

HEATING & AIR CONDITIONING

COMMITTEE—Hiram Z. Andrade, *G-E, chairman;* V. A. Labarthe, *Westinghouse, vice-chairman.*

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NURA Holds Annual Meeting

Northwest Utility Radio Assn. held its annual meeting at the Sheraton Hotel in Portland, with 30 attending. Chairman was L. A. Carter of Pacific Power & Light Co. Host was E. C. Phillips, Northwest Natural Gas Co.

Frequency Coordinator R. A. Benson of Seattle City Light in his report expressed concern over the heavy use being made of the 150-mc band and complete lack of new applications at 37 mc. He asked that members give greater consideration to the use of 450 mc wherever possible. It was his opinion, based on statistics, that the National Committee for Utilities Radio had been far too conservative in early estimates of radio usage placed before the FCC, and he recommended that support be given to current efforts made to obtain more frequencies for the Power Radio Service.

Harold Backen, past chairman of NURA and now vice-chairman, reported on national activities and the recent Geneva Radio Conference. Eighty-five countries were represented at the meeting and of some 700 delegates the United States provided 102. It was pointed out the radio frequency band designators, LF, VHF, etc., will be replaced by a numerical system up to 12.

Preliminary draft of a history of NURA was read by A. A. Noon of Puget Sound Power & Light Co. An "old-timer" of both NCUR and NURA, he brought many interesting bits and incidents into the draft, which was heartily endorsed by the members.

Sources and cures for radio interference in vehicles were discussed in a paper by Frank Emigh of the Tacoma Water Department. Emigh also provided a display of various noise suppression equipment and discussed its application.

In an informal talk FCC Field Engineer Francis McCann complimented the members on their conscientious efforts to comply with the regulations. In answer to a question, he stated that the recent order relaxing requirements for a licensed operator at a control point would have the effect of permitting an alien to operate a radiophone station in the Power Radio Service — subject only to the licensee's approval.

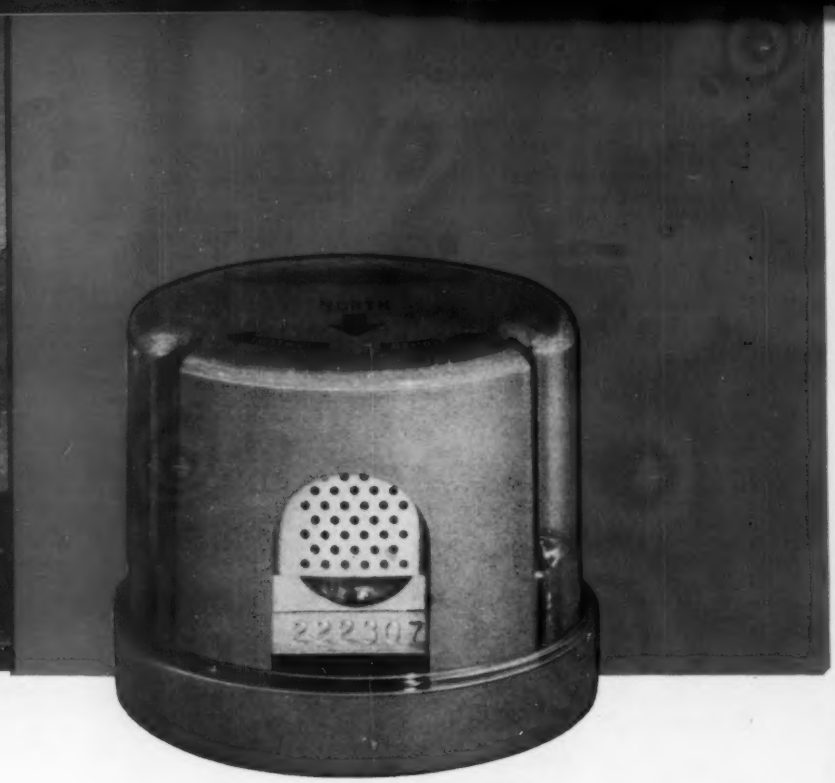
In addition to the individual presentations, there was a round table discussion on technical problems, centering particularly around microwave and mobile radio operations. Several members were concerned with the adequacy of available measuring equipment for setting up mobile radios to comply with the narrow band standards. Most members were using a standard that could be calibrated from WWV and then were setting the field instruments with it. They said they found this approach to be satisfactory.

Officers for 1960-61: E. C. Phillips, Northwest Natural Gas, Portland, chairman; C. F. Peck, Central Lincoln PUD, Newport, vice-chairman; John Scofield, Eugene Water & Electric Board, secretary; R. A. Benson, Seattle City Light, frequency coordination committee chairman; Frank Emigh, Tacoma City Water, information committee chairman; A. A. Noon, Puget Sound Power & Light Co., Kirkland, engineering and operating committee chairman.

► **San Mateo County Electric Club** named Art Gingell of Fred Nicholas Co. as its president for the year beginning in July. He succeeds William Hilton of PG and E. Harry Marshall of Federal Pacific Electric, Santa Clara, was named vice-president, and Louis Rolla, Coast Electric Co., Redwood City, was re-elected secretary-treasurer.

► A Denver chapter of NARDA was formed recently under the name of Colorado Appliance Dealer Assn. President is W. F. Martin, Colfax Radio & Appliance; vice-president, Leonard Robohm, Robohm Appliance & TV.

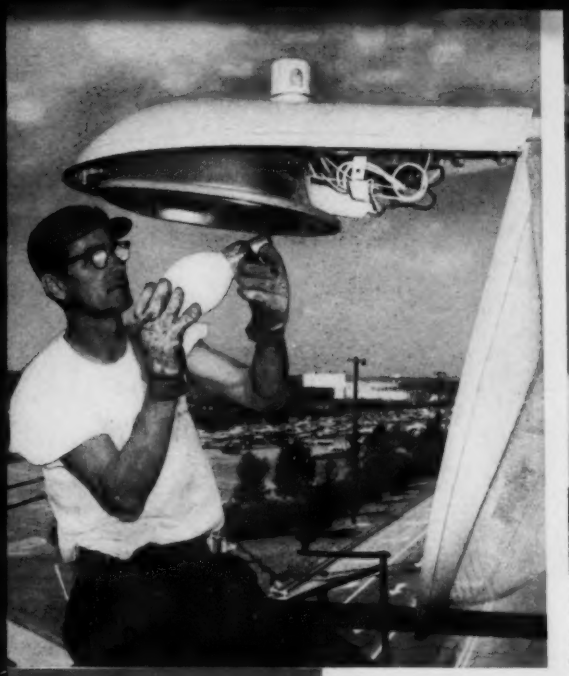
Cleveland Electric Illuminating Co. headquarters, the modern Illuminating Building on Public Square.



FISHER-PIERCE INDIVIDUAL-LAMP CONTROLS REDUCE CONVERSION COSTS, CLEAN UP SERVICE POLES IN CLEVELAND

Suburban Clevelanders are seeing more and more individual lamp controls on their streetlights, including Fisher-Pierce Series 6600A Controls, as The Cleveland Electric Illuminating Co. voltage conversion program continues through its second year. CEI found that modernizing the streetlighting system by changing to individual photoelectric control is a natural and highly practical part of distribution conversion. It eliminates the need for constant current transformers, oil switches and time switches, plus extra wire, insulators and hardware for streetlighting circuits, and new crossarms to isolate them from distribution lines. Conversion requires only connecting the streetlight into existing 120-volt secondary lines, replacing the lamp and installing a hood that meets EEI-NEMA standards — Fisher-Pierce controls also conform to the standard.

The new installation may be checked quickly, because of the short time delay in the controls. IL transformers, oil switches, time switches, constant current transformers and series wire can be removed, simplifying future pole work and improving neighborhood appearance. All of this in addition to dependable, automatic switching of streetlights, with light provided whenever it is needed.

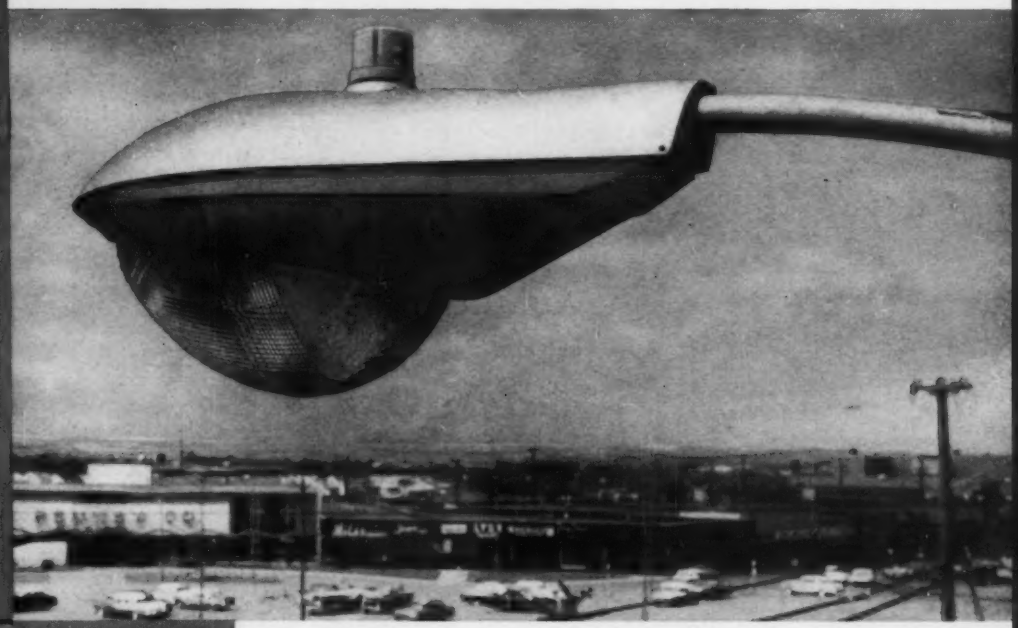


Easy calibration of F-P and other controls, using the Fisher-Pierce Series 6100 Calibrator. As the operator gradually varies the light intensity, a front-panel light indicates control operation and a foot-candle meter shows the operate value. CEI finds the Calibrator useful, particularly for acceptance testing and checking controls after repairs.

Short time delay in Fisher-Pierce Model 6600A control speeds up checking of new mercury vapor lamp (above). CEI reduces outage calls by replacing groups of lamps after a set number of burning hours.

Opening of new Southgate Shopping Center (right) reflects rapid growth in the territory vigorously promoted by Cleveland Electric Illuminating Co. as "The Best Location in the Nation"

Fast checking of a new F-P controlled installation (below) by covering the control with a homemade light shield. The short time delay in Fisher-Pierce Controls effectively prevents false turn-off by lightning—no cases have been reported to CEI.



For complete design information and specifications on Series 6600A controls and the Series 6100 Calibrator, write The Fisher-Pierce Co., 43 Pearl Street, So. Braintree 85, Massachusetts.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

Employee Gift Matching

Another Good Way To Help Our Colleges And Universities

The business community continues to make an impressive record in giving badly needed financial help to our colleges and universities. This year the Council for Financial Aid to Education expects that business contributions to higher education will be well over four times their total of about $40 million a decade ago.

If these contributions, which were about $150 million last year, continue to increase at the present rate, they will hit the target of $500 million set for business aid to our colleges and universities in 1970. This is the amount which, the Council calculates, must come from business if these institutions are to have the money to do their job properly a decade hence.

However, it would be a fine thing both for the nation and the business community if that $500 million dollar target were hit well before 1970. This would put us ahead of a schedule (it is a conservative schedule) in getting on top of what remains one of the nation's most crucial problems—that of having its colleges and universities adequately financed which they are very far from being right now.

There is, we believe, one quite simple way by which financial support for higher education by business firms might be considerably speeded up. All that is required is that business firms generally abandon the idea that it is possible for every company to have a program to provide such support that is novel and distinctive, and that this is the only way that interests of prestige and good public relations can be served.

There are nowhere near enough good plans to provide financial help for higher education to equip even a small percentage of our business firms with one that is novel and distinctive. Also **there are a number of very good plans which, so far as we can tell, lose nothing of their value for prestige and good public relations by being used by a large number of companies.**

The Gift Matching Idea

One plan with these attractive characteristics is the plan by which companies match the gifts of their employees to colleges and universities, and now increasingly gifts to independent secondary schools. So far as we can discover the general plan was invented by the General Electric Company, with what it calls its Corporate Alumnus Program. Now, with variations on the same basic design, almost 100 companies have gift matching plans. We at McGraw-Hill are included in this number.

The gift matching plans vary considerably in detail. Some are limited to alumni of the schools to be benefited. In others any employee can participate by making a gift to an eligible institution. There are also variations in the maximum amounts of gifts by individuals and to individual institutions which will be matched. Some companies have "open end" plans; others limit the total to be matched in any one year. All of the plans, however, embody the same central gift matching idea.

When the plan was first launched some college administrators of little faith in the fundamental generosity of the alumni and friends of their schools expressed the fear that if gifts were to be matched they might be made smaller in the first place. The opposing view was that the possibility of having them matched would stimulate more and larger gifts.

Advantages Of Gift Matching

So far as we have been able to discover, the expectation that giving would be stimulated by gift matching has been validated by the experience with the plans. This has been our experience at McGraw-Hill. Some other important virtues of the gift matching programs have been summarized by

LEADERS OF SOME OF THE INSTITUTIONS WHICH HAVE SHARED IN THE McGRAW-HILL EMPLOYEE GIFT MATCHING PROGRAM EXPRESS THEIR VIEWS

"We particularly appreciate the fact that your grant is unrestricted, and can therefore be used for our area of greatest continuing need — the General Education Fund, from which faculty salaries come."

W. Boyd Alexander, Vice President and Dean of the Faculty
Antioch College

"We are grateful, not only for the financial support given to The Cooper Union by your company, but also for the stimulus it has provided our alumni in your employ to make annual gifts to their Alma Mater."

Edwin S. Burdell, President
The Cooper Union

"The gift matching program has a dual advantage. First, it acknowledges and repays a debt of honor to those colleges which, often at great loss to themselves, have trained and educated the men who are now among your personnel. This is most fair and equitable. Secondly, by offering to match up to a given limit the contributions of alumni, you encourage support of their own colleges on the part of graduates, who themselves are so indebted."

President Edward B. Bunn, S. J.
Georgetown University

"Thanks to your doubling of the annual gifts of one of our generous and loyal friends who works with you at McGraw-Hill, we are well on the way toward creating what for us will be an extremely helpful scholarship fund. This would not have been possible without the gift matching program."

C. Adrian Heaton, President
California Baptist Theological Seminary

Ernest T. Stewart, Executive Director of the American Alumni Council (1785 Massachusetts Avenue, N.W., Washington, D.C.) who would be glad to provide detailed information about them, and the names of companies having such plans. Of the gift matching idea he says,

> "*First*—it assures the corporation that its gifts go direct to those colleges and universities which have furnished it with trained manpower.
>
> "*Second*—it places responsibilities for the gifts on the institutions themselves and drives home the point that they must make a real effort with their own alumni.
>
> "*Third*—it leaves the final decision of corporate support basically to the employees."

For many companies which are fearful of complicating their relations with their customers by courting charges of favoritism if they provide direct financial support for any particular school or group of schools, this latter consideration can be of decisive importance.

The gift matching plan also has what for many companies is the very important virtue of being simply and easily administered. Some additional virtues of the gift matching plan, as seen by officers of institutions which have been beneficiaries, are indicated in the box at the top of this page.

Effective And Easily Managed

We at McGraw-Hill are well pleased with our gift matching program. It is a broad program in which all employees and a wide array of colleges and universities, both privately and publicly supported, are eligible to participate. We commend it as an effective and easily managed plan to provide urgently needed financial aid to higher education.

We also urge that business firms adopt this or one of a number of other very good programs of financial aid to higher education* rather than delay in the hope of hitting upon some quite new and distinctive plan. There are very long odds that such delay will prove unavailing. In the meantime our colleges will be losing financial help which it is profoundly in the interest of the business community and the nation to see that they get—and get fast.

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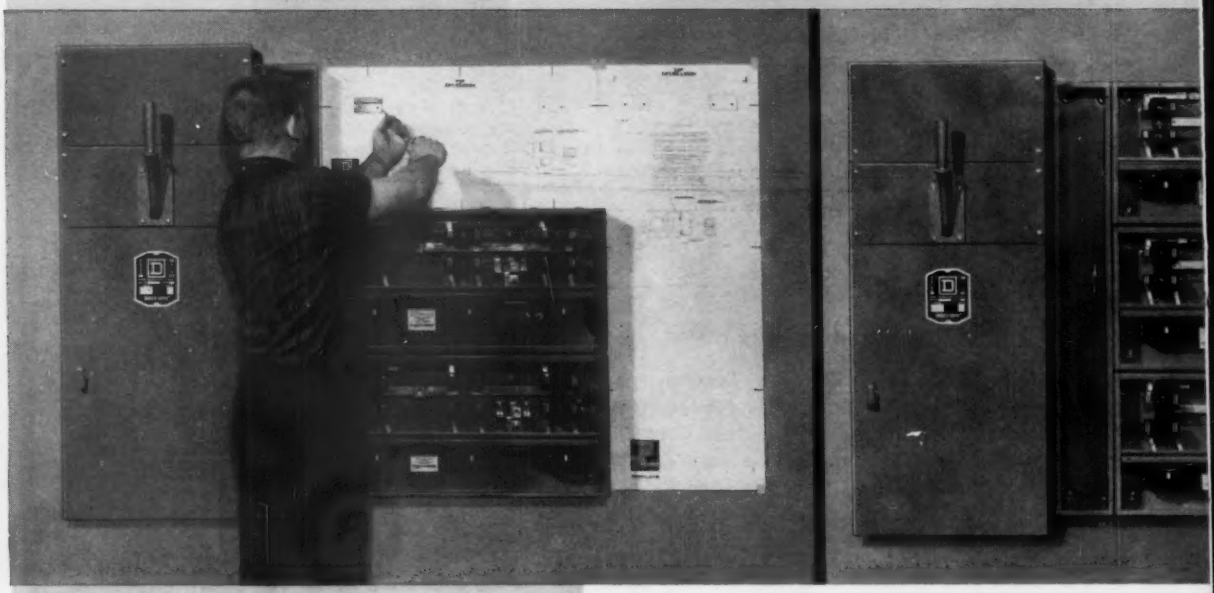
*An earlier editorial in this series dealt with tuition supplements as another good way to help our colleges and universities. Reprints of this editorial are available. So are copies of a "more or less socratic dialog," entitled, **A Business Wrestling with the Problem of Aid to Colleges and Universities.** It was prompted by the efforts of McGraw-Hill to find suitable methods of providing financial aid to higher education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

new D E-Z STACK



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PLAN YOUR OWN ARRANGEMENT — Available wall space for the service and grouping of meters is frequently limited — and of a particular size and shape. Required locations of service and load conduits vary with each job. With E-Z STACK you have freedom of arrangement.

TEMPLATE LAYOUT — For installation convenience E-Z STACK devices include a full size template and wall mounting hanger brackets. Templates, attached to the wall, accurately position the hanger brackets for each device. Brackets on the wall interlock with clips on the back of the device.

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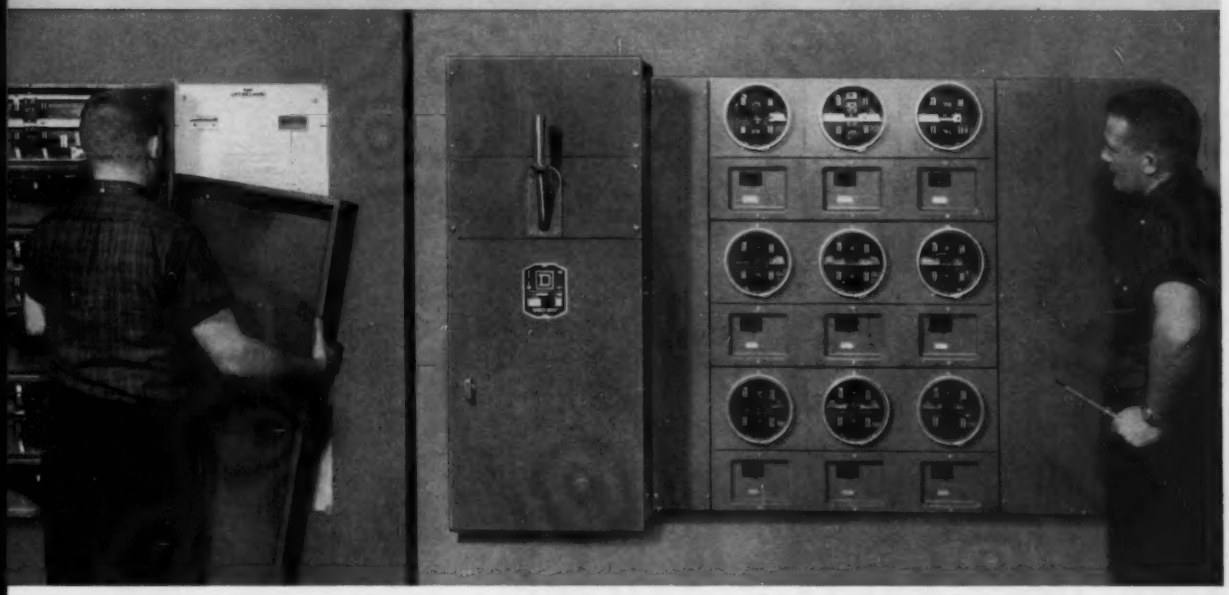
multi-metering devices



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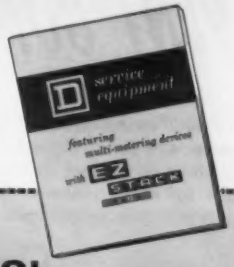

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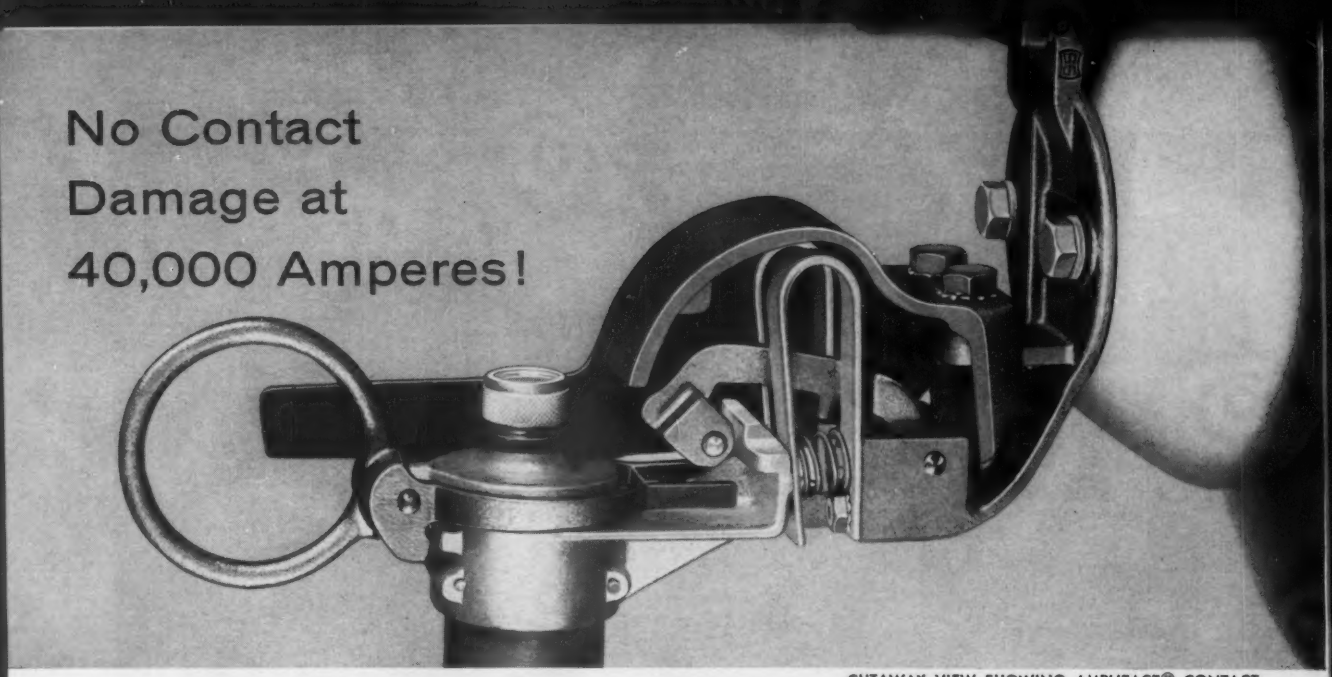


CUTAWAY VIEW SHOWING AMPLITACT® CONTACT

SOUTHERN STATES' POWER FUSES EMPLOY AMPLITACT® CONTACTS TO PREVENT CONTACT DAMAGE

Now, for the first time, "switch-proved" Amplitact® contacts are used on Southern States power fuses. Repeated tests at current ratings up to 40,000 amperes show no contact damage.

Used successfully for many years on Southern States air switches, Amplitact® contacts are now used on the new BPA and HPA Power Fuses.

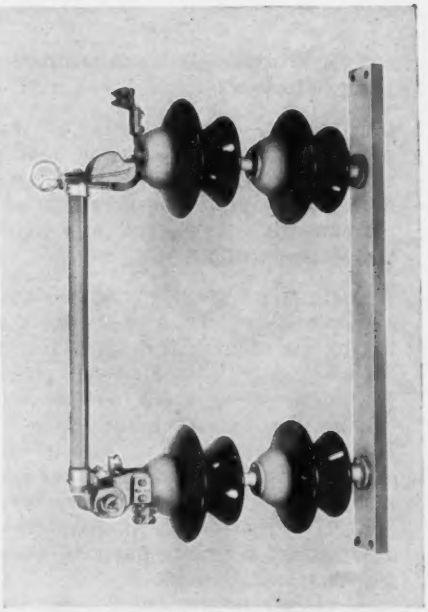
The Amplitact® harnesses electromagnetic forces generated on a high fault, increasing contact pressure when it is needed most.

While contact damage under extremely high fault currents has been more irksome than serious, the Amplitact® eliminates any possibility of damage.

These new power fuses have all of the outstanding advancements of the BP, MP, and HP power fuses introduced by Southern States in 1959—plus the reverse-loop contact. They have expendable cap fuse holders to provide dependable clearance of high or low current faults. Fuse holders are designed for easier handling and are equipped with a large operating eye. A stationary sleet shield gives better protection against icing and provides guidance when the fuse is slammed closed.

Low cost refusing in the field is accomplished with easy-to-use fuse kits.

Get your Southern States representative to give you full information about this important development in power fuses, or write direct for Bulletin 60 PF.



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Dominion Cutout Co., Ltd., Toronto

SS

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 125, NO. 2 AUGUST 1960

An economist takes a look at the West's economy:

A FIRST HALF REVIEW; LAST HALF OUTLOOK

DOUGLAS GREENWALD, McGRAW-HILL DEPARTMENT OF ECONOMICS

The Western area of our country continues to grow at a faster pace than the U. S. However the difference in growth rates narrowed slightly last year. The 1959 business recovery from the recession of 1957-1958 was not as strong, relatively, in the Western states as in the U. S. The reason for this, of course, was that the Western region did not suffer as much during the business decline as did the national economy. In turn, the national economy had to achieve a much bigger come-back in business than the Western area.

Income

Once again, however, the growth rate in the Western region appears to be improving relative to the nation's growth. Unfortunately there isn't a single gage of the region's over-all economy such as the gross product (the total value of goods and services produced) or industrial production (physical output of manufacturing, mining and utilities). The best over-all measure available is personal income, which accounts for more than 80% of the gross product in the nation and probably in the Western states too. And **personal income in the 11 Western states increased 8.5% in the first six months of this year compared with the first six months of 1959.** For the U. S. as a whole, personal income rose only 5.3%. Thus consumer income in the Western area is currently increasing at a rate 60% faster than in the nation.

Weekly wages in the manufacturing industry in the Western region did not follow the same trend as total personal income. While personal income registered a much bigger gain in the 11 Western states than in the U. S., the weekly pay check (before deductions) of the average manufacturing worker rose less in the Western region than in the nation as a whole. Manufacturing wages rose 1.5% in the Western area while the national average was up about 2%. However, it is significant that the level of wages is about $6 higher per week in the Western states.

Department Store Sales

Department store sales in the region did not register as much of a gain in the first six months of the year as sales of department stores throughout the nation. The increase in department store sales in the Western states was only a little more than 1% while the gain for the U. S. was close to 3%. However, first-half sales figures of Western area department stores show no decline from the second half of 1959, after seasonal adjustment, while sales are off slightly for the

Douglas Greenwald, who here talks to a group of foreign executives, made a special study of the Western region's economy as compared with the nation as a whole. His findings are given in this review of the first half and outlook for the second half of the current year

nation during this same period.

Employment and Unemployment

Total nonfarm employment in the Western states increased at about the same rate as in the U. S. in the first half of 1960 compared with the first half of last year. The gain in the Western region was about 2.6% while the gain in the nation was 2.5%. However in the Western area manufacturing jobs increased 3.2% while other types of nonfarm employment rose 2.4%. In the U. S. manufacturing jobs increased 3.6% while other nonagricultural jobs were up only 2.0%.

Despite this rise in employment, initial unemployment claims are increasing faster in the Western states than in the U. S. Unemployment claims are up 24% in the Western area while the nation shows only a 12% increase in this significant statistic. This relatively poor performance is due, no doubt, to the drop off in jobs in the aircraft industry in the Far Western states.

Construction

The construction picture in the Western area is far brighter than in the nation. Contract awards for industrial building in the January-June period are up a whopping 182% over the relatively poor first half of 1959. For the nation industrial construction contracts are up only 15%. These figures on industrial building indicate that industrial expansion is taking place at much faster pace in the 11 Western states than in the rest of the U.S.

Housing

And residential construction has held up exceptionally well in the Western region despite tight money and high interest rates. Families are still migrating toward the Western area of the nation so that demand for new housing in that region is relatively high. The number of new housing units started in the first six months of 1960 fell by only 13%. For the nation as a whole the decline in housing starts is just about double that rate.

Electric Power

Electric power production is following the trend of personal income very closely in the Western states, registering an increase of 8.9% in the first half of this year over the first six months of 1959. The increase of 8.5% in power generation in the nation was not far behind that of the Western area. However 1959 was relatively a considerably better year for electric power in the 11 Western states than in the U.S. as a whole.

Outlook for the Rest of 1960

The outlook for the remainder of this year is bright for the nation as a whole and particularly for the 11 Western states. The Western region may be expected to continue to outstrip the rest of the nation in the economic growth race during the last half of this year.

Industrial activity will pick up some in the late summer. Add to that a recovery in housing and in new defense orders and employment will once again register a good gain. Wages too may be expected to rise modestly in the months ahead. So we can look for per capita income and total income to increase. The result of rising incomes will be rising retail sales. All of these expected gains suggest further increases are coming for electric power production and consumption in the months ahead.

10 KEY INDICATORS

	WESTERN STATES				UNITED STATES			
	1st half 1959	2nd half 1959	1st half* 1960	Per cent change 1st half 1959 to 1st half 1960	1st half 1959	2nd half 1959	1st half* 1960	Per cent change 1st half 1959 to 1st half 1960
Personal Income (billion dollars)	5.27	5.31	5.72	+ 8.5%	31.38	32.02	33.03	+ 5.3%
Total Nonfarm Employment (million)	7.70	7.85	7.90	+ 2.6%	51.25	52.28	52.55	+ 2.5%
Manufacturing Employment (million)	1.86	1.94	1.92	+ 3.2%	16.02	16.32	16.60	+ 3.6%
Other Nonfarm Employment (million)	5.84	5.91	5.98	+ 2.4%	35.23	35.96	35.95	+ 2.0%
Department Store Sales Index (1947 = 100)	155	157	157	+ 1.3%	141	146	145	+ 2.8%
Housing Starts (Nonfarm—thousand)	32.9	29.9	28.5	— 13.4%	131.2	124.0	97.3	—25.8%
Industrial Building Contracts (million dollars)	19.7	35.0	55.5	+181.7%	261.59	326.49	299.43	+14.5%
Weekly Wages in Manufacturing (dollars)	95.43	96.13	96.90	+ 1.5%	89.33	89.67	91.00	+ 1.9%
Initial Unemployment Claims (thousand persons)	40.0	43.5	49.5	+ 23.8%	251.5	279.4	281.1	+11.8%
Electric Power (billion kwh)	11.02	11.63	12.00	+ 8.9%	57.63	60.66	62.50	+ 8.5%

Sources: Employment, Unemployment, Weekly Earnings: U.S. Dept. of Labor; Personal Income: Business Week; Department Store Sales: Federal Reserve Bank; Housing Starts: Census Bureau; Industrial Building Contracts: Engineering News Record; Electric Power: Federal Power Commission.
* Estimated by McGraw-Hill Department of Economics.

Top, conductor at point of tangency of suspension clamp. At this location, there were broken strands in all three layers. Lower, same conductor with part of outer and second layer broken strands fanned out. At right old armor rod is being removed

Pacific Gas and Electric Co. repairs

RIVER CROSSING HIGH LINE IN PLACE

J. T. MORGAN, SENIOR ELECTRICAL ENGINEER. PACIFIC GAS AND ELECTRIC CO.

During the spring of 1959, severe vibration was noted on two conductors of the Sacramento River crossing span of the Pacific Gas and Electric Co.'s Vaca-Contra Costa 220-kv double-circuit tower line. Damper weights were shaken off, and heavy vibration occurred until the dampers had been replaced. As conductor damage was suspected, an inspection of the conductor was scheduled for the fall when winds are usually of lower velocity.

Problem Line

When this line was built in 1924, the conductor used in the crossing span was 500 mcm Copperweld. The design was conservative but there had been little experience as to the vibration damage that could occur when high conductor tension and sustained winds were present. By 1944, vibration damage to the original conductor required its replacement. The present 795 mcm 63/19 ACSR was installed at that time.

Several factors are present which are conducive to vibration. The tension is high — approximately 28.5% of the ultimate at 66 F. This tension cannot be reduced without replacing the supporting towers as the Sacramento River is a navigable waterway and the present clearance cannot be reduced. Also present are steady winds with velocities of 10 to 25 mph at approximately right angles to the line. Winds of this velocity do not usually produce damaging vibration as they are normally gusty. However, at this location the cool air from the bay pours through a funnel along the river into the Sacramento Valley and relatively high, steady winds are experienced. The higher velocities are normally during the spring and summer months. These winds along with the high conductor tension produce a high frequency, short loop length vibration which is beyond the capabilities of standard Stockbridge dampers to control. This span has been the subject of several studies by PG and E and the conductor manufacturer, and specially designed 11-lb and 13-lb dampers have been developed to damp the vibration. During the inspection and repairs, the loop lengths were measured and found to be about 60 in. and the frequency was calculated to be 54 cps at 20 mph.

Inspection

A special dead-end board about 45 ft long, which had been built for working on the crossing towers, was hoisted into place. The top and

Left, section of outer and second layer of aluminum removed preparatory to laying in new strands. Additional sections of strands were later removed to give strand stagger. Right, installing 62 ft preformed armor rods after conductor repairs

middle phases of the No. 2 circuit were the ones on which the extreme vibration was noted. Armor rods were removed from these conductors and broken strands were found in the conductor at the point of tangency to the suspension clamp. The top phase on the north side had three broken strands in the outer layer and two of the armor rods were broken. It was suspected that there might be some broken strands in the middle layer of aluminum. However, to determine this, additional outer layer strands would have to be cut, and this was not considered advisable. The conductor was wire brushed, coated with an inhibitor and new 50-ft preformed armor rods installed.

Severe Damage Found

The middle phase on the north side was next inspected in the same way and was found to be severely damaged. Fifty-six of the 63 strands of aluminum were broken at the point of tangency to the suspension clamp. No broken strands were found on the line's steel core.

Repairs

With the assistance of the conductor manufacturer, repairs were made to the conductor by cutting out a staggered section of each layer and laying in new strands taken from a similar piece of cable. A 3-ft section was restranded in the inner layer, a 5-ft section in the second layer and a 7-ft section in the outer layer. The strands were laid in groups of three and the ends of

San Joaquin River crossing inspected by PG and E. Armor rod was pried open with screwdriver, left, to check conductor for damage. This location on the Vaca-Contra Costa line has an auxiliary cable arrangement for reinforcement and damping

the groups staggered about 4 in. The strands were tightened with a twitch and the ends held in place with polydyne tape. New armor rods 55 ft long were installed extending 45 ft on the river side and 10 ft on the land side of the tower.

The bottom phase of the No. 2 circuit on the north tower was then inspected. The preformed armor rods were carefully stripped off to a point outside of the outer 13-lb damper, about 6 ft out from the suspension clamp, and no damage was found.

The top and middle phases of the same circuit on the south side were found to be damaged, although not as many strands were broken. Repairs were made as described above. As only four strands in the inner layer were broken, this layer was not restranded. It is interesting to note that in the case of the inner layer, the broken strands were on the sides of the conductor, two on each side, rather than at the top and bottom where maximum bending stresses would be expected to occur.

The bottom phase was inspected in the same manner as the bottom phase on the north side and no damage was found.

No heavy vibration had been noted in the No. 1 circuit but on each tower one phase was unclipped, the armor rods stripped back to the outer 13-lb damper and the conductor was inspected. The other phases were inspected from a bosun's chair and no damage was found.

The top and middle phases of the No. 2 circuit on this crossing have had more vibration noted on them, and more damage due to vibration than the other four conductors. It is believed that the most plausible explanation for this occurrence is that when these two conductors were strung, they were left over night without armor rods or dampers. The following morning it was found that vibration had been so severe that the porcelain on some of the supporting insulator strings was broken. It is the opinion that this one night of unrestrained vibration caused strand wear which changed the flexibility characteristics making the conductor more prone to vibrate.

Repairs Tested

After the repairs were completed, an electrical test was made to determine if there was excessive temperature rise in the repaired sections. Two units at Contra Costa power plant were separated from the bus and placed on this line. The hot-spot tests were made with an infrared pyrometer, which was set up on the tower at each conductor level. Observations were made at 300-amp and later 600-amp load after allowing the temperature to stabilize. It was found that the maximum temperature rise above ambient cable temperature in the repaired section at the 600-amp load was 7°.

Span Data

The crossing span is 4,135 ft in length and is supported by two double-circuit suspension towers 410 ft and 459 ft high, respectively. The conductor is dead-ended on special 100-ft dead-end towers 1,919 ft and 1,975 ft from the crossing towers. The conductor is 795 mcm 63/19 ACSR. Ultimate strength is 35,700 lb. Maximum design tension is 15,200 lb at 25 F and an 8-lb wind at right angles to the line. Normal tensions at 66 F with no wind is 10,200 lb approximately 28.5% of the ultimate strength. The conductor is supported at the suspension towers with double strings of insulators. Preformed armor rods, varying in length from 41 ft to 62 ft support and reinforce the conductor. Special 11-lb and 13-lb dampers are installed over the armor rod.

SET 11 POLES A DAY IN ENERGIZED LINE

Use of a 27-ton crane with 110-ft boom enabled the Snohomish County PUD to place 70- to 85-ft power poles in an energized 12.5-kv line at the rate of 11 each 8-hour day, more than double the normal rate.

Rather than tilt the poles into position, the PUD decided to frame them on the ground with insulators and finger lines, lift them up over the live wires on the existing 40-ft poles and lower them into position between the wires. The Roth Construction Co. of Seattle was awarded a $42,000 contract to construct the 7-mile highline tie from Paine Air Force Base south along the Pacific highway to Lynwood, with PUD-furnished materials.

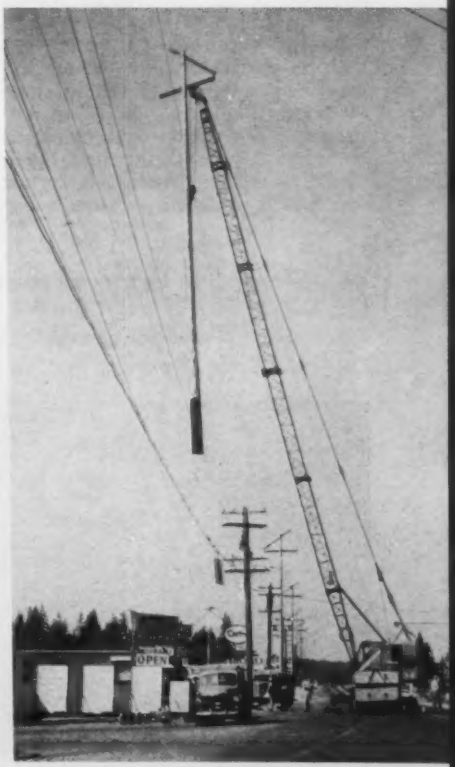
De-energizing the existing line was impossible because it was the source of power for many businesses along the highway, as well as homes. Lowering the 5,000- to 7,500-lb poles between the wires with the crane was felt to be safer than tilting the poles up from below and also less of a traffic obstruction.

The poles were left at designated locations along the highway by the pole contractor, after which a 30-in. hole was drilled to a depth of 7 to 9 ft at each location by a Highway Digger. In some cases, where the pole had to be left a short distance from the highway, a line truck was used to drag the pole within reach of the crane.

A steel winch line extending from the crane boom then was fastened to the pole, at about the three-quarter mark, and the pole lifted above the lines. A lineman on the existing pole guided the pole between the lines by means of a rope tied around the base of the pole. Other ropes were used to spread some of the wires.

Roth Construction Co. used a 7-man crew for the pole setting, in addition to the crane operator. Three men were employed on the digger and two linemen for the "wishbone" framing.

The new line ultimately will have a 115 kv capacity but temporarily will be limited to 55 kv, said Leroy Burleson, project engineer for the PUD. Room is available on the poles for additional circuits.



Reappraisal of bulk power transfer schemes shows

EHV SYSTEMS CAN BE ECONOMICAL

E. W. DUBOIS, SPONSOR ENGINEER, ELECTRIC UTILITY ENGINEERING
J. F. FAIRMAN JR., ASSISTANT SPONSOR ENGINEER, WESTINGHOUSE ELECTRIC CORP.

Dynamic growth of large geographical areas is brought about by the plentiful existence of some natural resource; it may be a varied abundance of raw materials, favorable geography, propitious climate or some combination of these factors. The Western states comprise a vast region offering such abundance, and the explosive development of this area during the past two decades has been a natural sequel in the course of the nation's growth. For example, as a continuation of this expansion, one need not look too far into the future to see a contiguous metropolitan area extending from Los Angeles to San Francisco, similar to that area existing on the East Coast between Washington, D. C., and Boston.

Electric power producers will continue to contribute, as they have in the past, to the patterns of growth by providing facilities whenever and wherever required. In general, it will be desirable to serve the expanding load from relatively close-in generation sites. However, unfavorable legislation and delivered fuel cost increases can make such plans impractical. Alternatively, low cost fuel is available in large quantities at locations remote from the anticipated load areas.

Major Economic Factors

In the United States transmission voltages above 230 kv are generally considered as extra-high voltage (EHV) transmission. The economics of long distance EHV transmission is subject to much manipulation because of the many variables present. However, for a specified transmission distance and operating voltage three major factors that influence energy costs are apparent: transmission line cost per circuit-mile; the load factor of the line; and the megawatt rating of the circuits. Higher transmission voltages permit the transfer of more megawatts more miles, and there is every expectation that this can be done within feasible economic limits.

Technical Feasibility

Two major field investigation projects have been carried on in the past fifteen years to determine parameters and solutions to problems associated with EHV transmission: (1) the Tidd Project; 1946-1952, 500-kv transmission-line tests; (2) the Leadville Project, 1956 to the present, 500-kv high-altitude tests. Other projects are now under way to study system voltages above 500 kv. Field test programs have been supported by extensive analytical study, which has contributed much to the fundamental knowledge of power system and equipment behavior.

In response to the demands for higher voltages and the requirements determined by field, laboratory and analytical studies, equipment development has kept pace making possible the construction and operation of EHV systems.

Economic Feasibility

High capacity EHV transmission lines can compete favorably with other available methods of transporting energy over long distances. As normal fuel costs increase, fuel reserves offering energy at a cost of 15 to 25¢ per million Btu will become increasingly attractive. As economic hydro sites are exhausted, low cost coal at remote sites plus the associated long distance transmission must compete with nuclear genera-

Fig. 1—Single line diagram of system used in study
Fig. 2—EHV cost as influenced by load factor
Fig. 3—EHV cost as influenced by line cost
Fig. 4—575-kv transmission cost

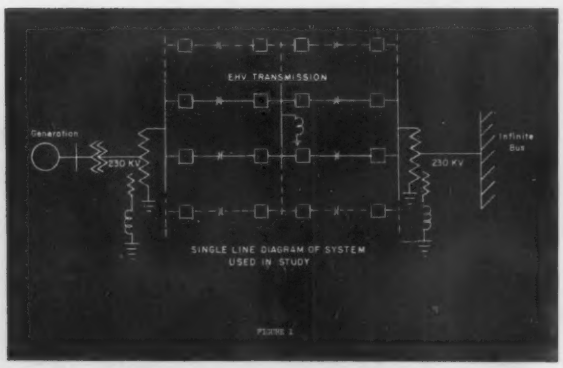


FIG. 1

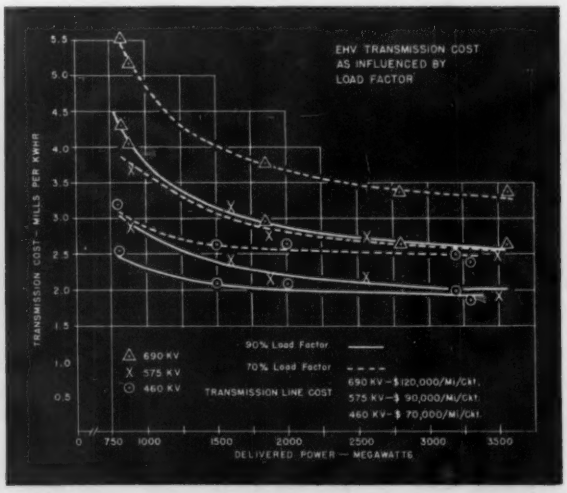


FIG. 2

tion near the load centers.

Figs. 2 and 3 illustrate graphically the comparison of delivered energy costs for a 500-mile line at three possible voltages, 460, 575 and 690 kv. The sensitivity of the economic pattern to load factor is evident in Fig. 2. Capital investment and fixed charges are high, which indicate large amounts of power must be carried at a high load factor to insure the feasibility of any long distance transmission project.

Reference to Fig. 3 shows the importance that must be attached to low cost line design. The transmission line cost represents approximately two-thirds of the total cost of transmission. Tower cost is the only factor of line investment which can be reduced to any degree, so it is this component of design that must receive increased attention if the cost picture is to improve.

A relatively inexpensive method for improving the transient stability level of the system shown in Fig. 1 is to utilize a switched braking resistor at the sending end generator bus. This braking resistor is closed into the circuit just after the faulted line section is cleared, and is removed just prior to reclosing the line section. The comparative economics of such a plan and the one described earlier are shown in Fig. 4 for a transmission voltage of 575 kv. The same series compensation and number of lines were used for each comparative case, the cost curves being derived from a resulting increase in power transfer under stable conditions using the braking method. No attempt was made to optimize the size of the braking resistor for the cases examined. Resistor ratings of 333 mw and 500 mw were used.

Fundamental Assumptions

These curves reflect the usual economic penalty of providing firm power. Transmission costs are based on the number of parallel circuits and equipment required to insure stable operation following a three-phase fault just off the EHV sending bus and subsequent isolation of the line section. Admittedly the three-phase fault criterion is excessively severe and has penalized the resulting economic picture. The probability of three-phase faults on widely spaced flat-line configuration is quite low. Shunt reactors were used to establish reasonable open circuit voltages on the system. Series capacitors were used to improve the power transfer and transient stability. Maximum compensation was 50% of the series reactive impedence of the line.

The number of parallel single circuits required varied from two to six depending upon the voltage and the power transferred.

Conductor sizes and configurations were chosen so as to give acceptable radio influence and corona performance. This criterion necessitated the use of a two-conductor bundle at 460 kv, a three-conductor bundle at 575 kv and a four-conductor bundle at 690 kv.

Summary

The necessity of delivering large blocks of low cost power from remote generation sites is only one of three maor reasons for considering extra-high-voltage transmission. The other two are: (1) Future right-of-way restrictions in highly developed load areas; and (2) emergency and economic interchange of energy between adjoining systems. The economics of these two situations are subject to even more diverse influences due to specific features other than the low cost energy case examined.

Analyses such as the foregoing serve to illustrate that transmission of large power blocks over a distance of 500 miles can be justified if the fuel cost differentials approach 15 to 25¢ per million Btu. Distances greater than 500 miles will require greater fuel cost differentials, but such disparities may well develop in the future.

Two principal means are available to reduce transmission cost in terms of mills per kwh, thus reducing fuel cost differential requirements:

1. Reduced capital investment
   - A. Low cost tower design
   - B. Re-evaluation of line insulation coordination
2. Improved power transfer capability through increased capital investment
   - A. Reduced transformer and generator reactances
   - B. Additional line (series) reactance compensation
   - C. High inertia machines
   - D. Generator braking resistors
   - E. Additional transmission line sectionalizing

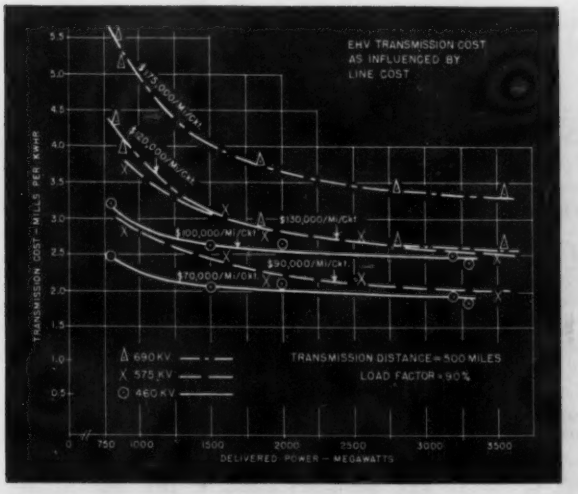


FIG. 3

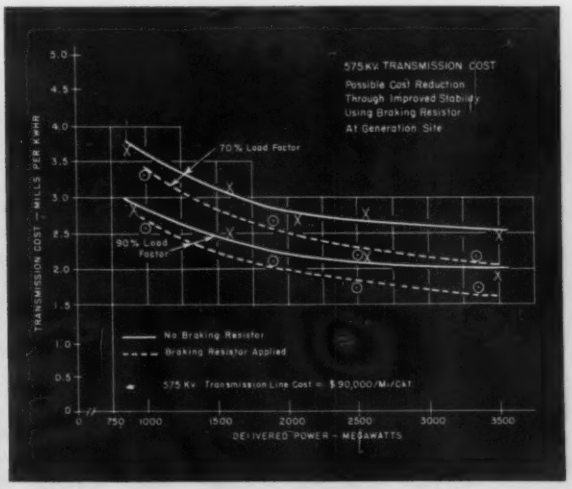


FIG. 4

As we become more power dependent, service interruptions become a measure of service quality. To develop a yardstick and improve service, Edison company uses machine accounting to pinpoint . . .

DISTRIBUTION CIRCUIT INTERRUPTIONS

MONTE R. MOSQUINI, SENIOR DISTRIBUTION ENGINEER
JAMES A. LIGHTHIPE, OPERATING ENGINEER, SOUTHERN CALIFORNIA EDISON CO.

Southern California Edison has recently placed in service a simple punch card and machine data recording process to record distribution circuit interruption data. Out of these records there is expected to come a better standard of service reliability and indications of how to improve it.

In initiating a system of automatic cataloging and reporting of interruptions, Edison has reviewed all possible benefits of such a program, both immediate and long range, and developed a simple, practical program that would cover the majority of these benefits. The desired long-range result was improved service to customers. To reach this goal, a better standard of service reliability had to be established, as well as a method of measuring it.

Criteria Established

The establishment of such a standard of measurement proved to be an extremely difficult task. The 1959 peak on the Edison system was 3,181 mw. The distribution system, which serves 1.6 million customers over an area of 20,350 square miles, is made up of more than 2,000 individual circuits varying in voltage from 2.4 to 16 kv. The responsibility for operating and maintaining this distribution system is divided into four divisions and 29 districts. Because of geographic locations, weather conditions, load concentration, contamination, etc., the problems of one district or area are not necessarily directly comparable to other districts or areas. Unable to arrive at a single standard, several indices were selected, which could be used in evaluating the degree of our service reliability. These indices are:

1. Customer minutes of interruption per customer per year

2. Peak megawatt minutes of interruption per peak megawatt demand per year
3. Number of interruptions per 100 miles of line per year
4. Customer minutes of interruption per mile of line per year
5. Total number of interruptions occurring during the past 12 months.

Present plans are to prepare one monthly report as shown in Fig. 3 and three annual reports. The monthly report will list all interruptions during the past month, segregated by district and division. This report lists in code all particulars of each interruption. Following the listing of interruptions for each district will be the five indices for the system, the division and the district.

The annual reports are expected to be:

1. Summary of all interruptions classified by cause. This report will be used by the distribution engineers to check the quality of distribution construction methods and materials.
2. Summary of relay reliability. This report is for use by system engineers for analyzing relaying practices and efficiency.
3. Repeating circuit interruption report. This report will list all circuits interrupted "X" or more times, all circuits having a total interruption time in excess of "Y" hours or a partial interruption time in excess of "Z" hours.

This report will point out the areas where work is most needed to improve the standard of service. The appropriate limits of total interruption time can be adjusted to meet required conditions.

It is expected that many special reports or tabulations of specific information will be required from time to time. These might be: a review of damage and interruption time caused by a particularly severe storm; a several-year review of interruptions caused by crane contacts for the safety division; or a comparison of the number of faults proving temporary on the first, second or third test reclosure.

In developing this new system, it was necessary to secure much statistical data from each distribution division. This included such information as the number of customers on each line, circuit miles of line and peak megawatts, which is entered on master punch cards. It was also necessary to develop a code system and assign a code number to each distribution circuit, each substation and each distribution switching center. This program also required a check of many records to determine the most common causes for distribution circuit interruptions. These data were used to form the Cause Code Instruction bulletin. A page of this instruction bulletin is shown in Fig. 1.

The evaluation of interruption data can be no better than the information gathered. For this reason

R. C. Parnell Jr., first operator at Alhambra switching center, prepares circuit interruption report. He uses cause code (see Fig. 1 below) to indicate reason for outage

Non-Controllable Outages
Non-Employees — 500 Series

Cause	Code Number
Vehicle Hit Pole	500
Vehicle Hit Guy	501
Persons Shaking Guy	502
Spray Rig Contacted Line	503
High Load	504
Farm Equipment	505
Boat Mast	506
Housemovers Contacted Line	510
Housemovers Contacted Guy	511
Aircraft Breaks Line	512
Contacted Line	513
Breaks Pole	514
Contacted Pole	515

Fig. 1—A page from the cause code manual

DISTRIBUTION CIRCUIT INTERRUPTION REPORT

AKRON 12 KV LINE

DIVISION	DISTRICT	MONTH	DAY	YEAR	HOUR	MINUTE	CIRCUIT NAME CODE	VOLTAGE	ENTIRE CIRCUIT	PARTIAL CIRCUIT	ORIGINAL	ADDITIONAL	AUTOMATIC P.T. OCB TYPE	AUTOMATIC P.T. OCB SWITCH NUMBER
2	2 9	0 9	2 7	9	0 1	3 0	0 0 1	9 0	4	0 2 5 0	0 7 0 0	5 0 0	9 4 4	0 0 0 0

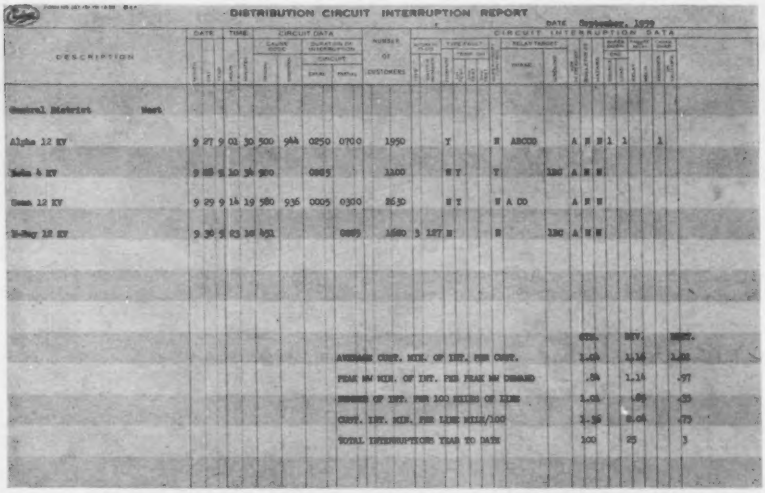
SWITCHING CENTER	BULLETIN 32 HAZARD	CIRCUIT INTERRUPTION DATA: INTERRUPTED	LINE RELAYED	TYPE OF FAULT: MOMENTARY	TEMP. ON 1ST 2ND 3RD	PERMANENT	RELAY TARGETS: PHASE	GROUND	HIGH VOLTAGE BUSHING	HIGH VOLTAGE END BUSHING	HIGH VOLTAGE LEAD	FAILING TO RELEASE	FAILING TO RELEASE (BACKUP)	CHANNEL HANG (BACKUP)	CHANNEL HANG
8 2 5	N N	Y Y Y	- - -	N	A B C C O	- - - -	A A A	- - A	-						

DETAILED DESCRIPTION OF TROUBLE:

H. C. Jones 3/28/59
DISTRICT SUPERINTENDENT DATE

A. A. Neff 3/28/59
SUBSTATION OPERATOR DATE

Fig. 2—Report form used by Edison employees in the field to report interruption data



DISTRIBUTION CIRCUIT INTERRUPTION REPORT

DATE September, 1939

DESCRIPTION	DATE	TIME	CIRCUIT DATA: CAUSE CODE	DURATION OF INTERRUPTION: CIRCUIT DAYS	DURATION OF INTERRUPTION: CIRCUIT MINUTES	NUMBER OF CUSTOMERS	CIRCUIT INTERRUPTION DATA: NUMBER	TYPE FAULT	RELAY TARGET: PHASE	RELAY TARGET	RELAY TARGET	BUSS TIE: PHASE	BUSS TIE: TARGET	BUSS TIE: TARGET	BUSS TIE: TARGET
General District West															
Alpha 12 KV	9 27	9 02 30	500	944	0250	0700	1950	T	B	ABCG		A	B	1	1
Beta 4 KV	9 28	9 10 30	900		0825		1200	B T	T		12G	A	B		
Gamma 12 KV	9 29	9 14 19	580	936	0005	0300	2630	B T	B	A CG		A	B		
Bi-Ray 12 KV	9 30	9 23 10	491			0825	1680	3 127 B	B		12G	A	B		

	CUR.	DEV.	DEPT.
AVERAGE CUST. MIN. OF INT. PER CUST.	1.69	1.16	1.28
PEAK KW MIN. OF INT. PER PEAK KW DEMAND	.89	1.14	.97
NUMBER OF INT. PER 100 MILES OF LINE	1.05	.89	.35
CUST. INT. MIN. PER LINE MILE/100	2.39	8.04	.73
TOTAL INTERRUPTIONS YEAR TO DATE	101	25	3

Fig. 3—Monthly report for guidance of operating management. Criteria lower right compare system, division and district performance. Annual reports are made also

all forms, both those for the collection and transmittal of interruption information, as well as those that report the results, must be simple and easily understood. The form used by distribution and substation personnel for collecting the interruption data is shown in Fig. 2.

Whenever a distribution circuit interruption occurs, data are recorded on forms prepared by both the distribution switching centers and distribution district personnel. After a check by the engineers in charge of this program, the data are then key punched into a detail card and used to prepare the required reports.

Careful Check Needed

It appears most important that, whenever a data-recording process of this type becomes a daily function of operating personnel, all instructions issued for preparing the reports and data recorded on the circuit interruption must be carefully checked. Clear-cut instruction bulletins must be written for field personnel who work with this program. Group meetings must be held to instruct properly the field personnel in the function of this new program. All code manuals and instruction bulletins must be continually checked and rewritten to keep the program on a current basis.

Prior to initiating the new data recording system, a station interruption at a distribution or transmission substation would have been recorded only as a station interruption. Now, to make the statistics complete, a punch card is prepared for each line on the system that was interrupted. This includes pole-top substations carried on a distribution circuit. Whenever a multiterminal distribution line is interrupted, the data for only the source terminal of the line are recorded.

The engineers working with this program have elected not to record interruptions to an unattended station due to the loss of a source line, if the emergency line closed immediately and picked up the load. This is considered a normal function of the automatic change-over equipment.

During the development of this program by Edison, it was discovered that an existing accounting coding system in use by the company could be utilized after a few minor changes.

The machine data recording process will make available statistics on the performance of distribution circuits and equipment. Individual distribution superintendents will be able to use the information secured from the monthly reports to check the performance of their distribution circuits as an aid in improving customer service. For example, data from an annual check of causes for circuit interruptions may indicate that conductors in slack spans may have blown together during windstorms. Based on this information the distribution people will change their line design.

Not only are distribution people aided in their work by this new program but protection engineers, load dispatchers and substation personnel gain useful information.

There will be data for protection engineers on operation of the relays on the interrupted circuit; also a record on the relay targets and a punch card record on the causes for relay failures. The protection engineer is also concerned with the number of conductors that have burned down because of the short circuit. All these causes and reason for the cause have been individually coded for this program.

The system dispatcher may check causes for circuit interruptions and the performance of automatic change-over operations at unattended stations.

The substation superintendents and engineers can obtain, on demand, information on the operation of their substation circuit breakers and equipment.

Much of this information has been recorded previously but required many forms and reports. For example, a daily report has been prepared for many years by the system load dispatcher's office recording all data on 2.4-, 4-, 7-, 12- and 16-kv distribution circuit interruptions. This is a manual process and is time-consuming. Many times the system dispatcher has been asked to prepare reports on the number of cars that have broken poles, number of trees that have caused circuit interruptions, number of interruptions because of various types of weather—wind, lightning and snow. These reports were prepared by a time-consuming and tedious process of checking each daily report, not only for one day or one month but in some instances for several years. Much valuable information has been overlooked because of the cost and trouble involved in placing it in usable form.

Punch Cards Used

In an effort to save time, to minimize cost and to have the statistical data available when we desire to check distribution system performance and prepare reports, it was decided to place all the information on punch cards.

The data supplied on circuit interruptions are proving to be beneficial to many divisions of the company in improving the reliability of service to customers. By collecting and coding this information, we develop a vast store of statistical data which is invaluable for analyzing the causes of service interruptions and devising methods of reducing the most common reoccurring causes and improving the service to our customers.

So Boats May Tap Shore Power

At sea the small craft fishing fleet may generate its own electricity but in port it relies on getting power from the shore in one way or another. Usually the way is by use of long cords to sources of electricity and too often in pretty hazardous and haphazard fashion.

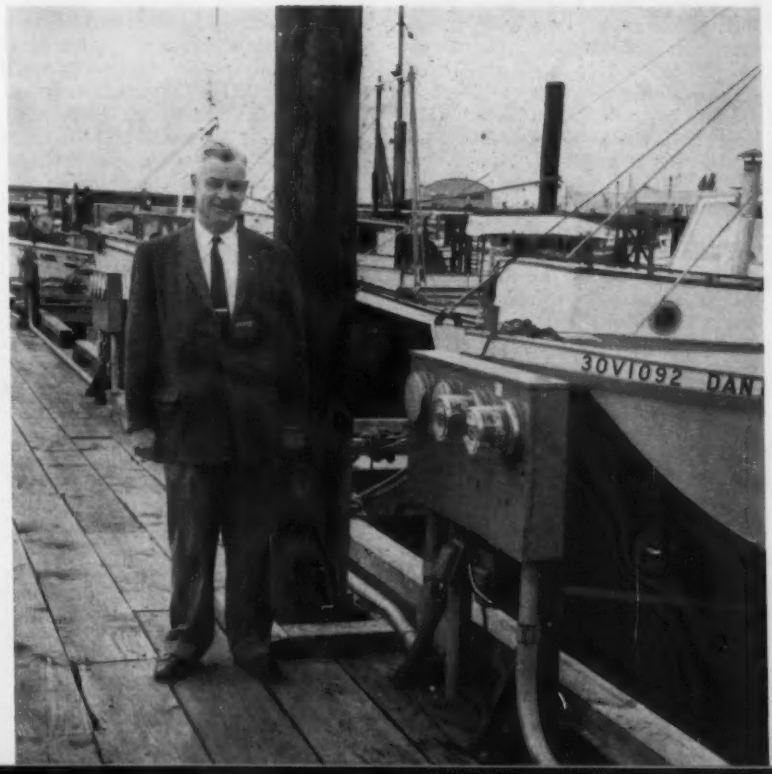
The Port of Bellingham, Wash., is an important fishing craft port. Its Squalicum harbor is devoted to the small craft, both of the commercial fishing fleets and to pleasure craft. Only recently it has rebuilt this harbor facility and installed safe and up-to-date electrical service facilities for the large number of boats tied there between fishing runs.

The first such main float with five "fingers" floats off at right angles to it has recently been completed and the modernization of the other floats is under way in similar fashion.

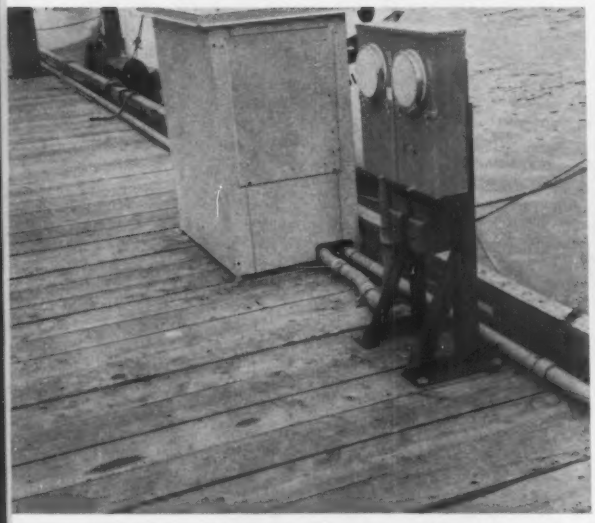
The distribution system provides grounded outlets in weather-resistant metal enclosures for 120- or 240-v, three-wire power adjacent to every craft tied up to any of its 180 berths. This is metered by Puget Sound Power & Light Co. to the individual boat owners. Puget Power provides meters in a meter socket panel which, like the distribution system itself, is provided by the port.

Power is received from Puget from a pole at dock site at 2,400 v to a main disconnecting switch on a port-owned pole. To compensate for the rise and fall of the tides, a maximum of some 12 ft, three No. 6 conductors are carried in 2-in. conduit from the disconnect switch down the pole and under the dock to a pull box mounted there. From this junction and pull box a 5-kv, three-conductor SH-D cable with neoprene jacket is fed into a 3-in. plastic conduit down a piling to the floor of the bay. From there the cable itself lays bare in the water in an ample loop to compensate for tide rise and fall and terminates in a junction box near the end of the main float.

This main float, supported by sty-



Fluorescent units mounted on piling light the area (above). Lighting only is served overhead by copper triplex cable. Dry-type transformers at end of each finger float serve boat meter and outlet cabinets. At right, G. L. McDonald, Puget Sound Power & Light, beside a typical meter panel



Dry-type transformer with meter and outlet panel alongside

Typical arrangement of outlets across deck from meter panel

rene foam logs, is held in place by a series of piles which rise above it and provide a base for the lighting installation of fluorescent units over the entire area.

From this junction box the No. 4 neoprene primary conduit conductors are carried in 2-in. conduit along the deck at the edge of the float. These feed five dry-type transformers of either 25 or 10 kva, depending upon their load. These are located on the main float where one of the finger floats joins it.

The finger or service floats are supported by logs and are independent of the main float. Tom Glenn, port engineer, who designed the system, attributes the success of this project to the fact that each of these service floats can absorb a certain amount of the wave and wind action independently without transmitting the stresses to the main float.

From each transformer a loop of 1/0 neoprene cable is threaded through a conduit stub to the deck level (for mechanical protection) and then looped under the master float to the service float into a similar conduit stub and thence to a series of four-gang meter socket panels with 20-amp circuit breakers under each meter. These meter socket panels are spaced between berths along each of the finger floats.

Outlets for the use of the boat owners are provided, two under the meter socket panel and two on the opposite side of the float decking. Stubs of conduit are used only for mechanical protection. The outlets are fed with a three-conductor, No. 12 cable.

To ground the entire system to a common ground copper tubing was run at the water's edge along the edge of each float and connections made to this common bond.

Lighting

Lighting, both for the 927-ft-long master float and its six service or finger floats, is done with fluorescent luminaires equipped with two 24-in. lamps in an enclosed housing. These luminaires are attached to the top of 2-in. galvanized iron pipe bolted to the ends of the piling. A reducing T 2x½x2 in. is mounted at the top to which the luminaire is affixed. Off the ½-in. branch a weatherhead is mounted and the unit is served by all-copper Triplex cable to eliminate corrosive action as much as possible. This cable is fastened to the upright pipe by a clamp-on insulator and a tap made to the fluorescent unit through the weatherhead. These feeders for the lighting system are the only aerial service in the port.

The lamp delivers 2,700 lumens at 110 v and provides an average of 2 f-c on the deck. Units are spaced 80 ft apart and an average height of 20 ft is maintained, although this varies as the floats go up or down with the tide while the lighting units remain stationary. The lighting is turned on by photoelectric cell control.

Asked what special problems were encountered, Wayne Demming of Farm Electric Co., Bellingham, electrical contractor who made the installation, said that the major difficulty was to work with the tide. Farm Electric made use of a warehouse at the dock as a shop and the panels were made up there.

The conduit was installed first and then the racks to hold the panels as well as the transformers were installed later. This was done to avoid as much as possible jockeying of the racks. As it was, they were straddled over the conduit.

Considering all means for doing so, ordinary wheelbarrows were found to be best to transport the racks onto the dock and put them in place.

To install the lighting units with the tide constantly changing, Demming found that stepladders mounted on a dolly were more versatile than any scaffolding or other means would have been. A portable generator was used to provide power on the job during construction.

Meters along pleasure boat harbor float

HOW PORTLAND INSPECTORS LEARN THEIR CODE

Word that Joe Gray, Portland's chief electrical inspector and IAEI Northwestern Section president, had suffered a heart attack was received just as this was in preparation. His recovery is reported to be good but he may not be able to preside at the Northwestern Section meeting.

Most of the hassles between electrical inspectors and their public—contractors, consulting engineers, architects and the public generally—can be attributed to lack of knowledge of the rules. Little can be done by inspectors to develop better understanding by their public, although they do a great deal in avenues where they can. These include teaching of apprentices, helping to retrain journeyman electricians, occasional appearances at industry meetings and the holding of open chapter meetings of International Association of Electrical Inspectors, to which others are more than welcome.

Another means of passing on knowledge has developed recently with the complexity of modern installations. Many inspection departments require that plans for all projects involving any complexity be submitted to them for checking before permits are issued and work started.

To train their own people to have more knowledge of the rules has often been a subject of discussion at IAEI meetings. No organization in the industry is more conscientious in wanting to improve itself along these lines than the inspectors.

Of recent times there have been stirrings in many of the sections of the country to establish training courses for inspectors. The Southwestern Section has a committee working on the preparation of training manuals for such courses. These courses would be conducted by chapters or by local inspection authorities.

Asked to do something about such a training program in the Northwestern Section, Joe S. Gray, chief electrical inspector of Portland and Northwestern Section president, has expressed the thought in the minds of many other inspectors. It is the question whether such a formal training program can do the job as well as a realistic and practical approach to it by the local inspection department itself. His own experience in Portland gives rise to this question. Such a practical program has been carried on informally and seems to be producing results.

It is simple enough but it does require consistent follow-up. On the second and fourth Friday of each month from 10 to 12 a.m. all the inspectors of the Portland department meet. A few days prior to this a set of 10 or 12 questions has been worked up by Gray and copies of these questions distributed to each of the inspectors. These questions are to be answered at the meeting.

Rather than assign a question to a man in advance, when all are together, the individual questions typed on a piece of paper are drawn from a hat by each of the inspectors and, thus, without knowing which question each inspector is to answer he must be prepared to answer all.

To concentrate the questions on the Portland ordinance itself and not confuse it with the National Electrical Code or state code, the answers are to be given with specific numbers of the Portland code.

These short sessions have proved stimulating and have caused the inspectors to study their own code. Where they err in interpreting what sections apply the discussion will bring this out.

Such matters as public relations or meeting of the public and procedure and administration are also discussed briefly in the short meetings. Problems brought up by individual inspectors in relation to any of these can be answered directly there.

Additional educational opportunities are afforded in Oregon. The State of Oregon's Inspection Department sends out similar questionnaires to its inspectors in the field and of late has been asking for section number answers also. These are to be answered by correspondence as it is impractical to bring the field force in to a central point very often.

Roger Niedermeyer, Portland's assistant chief inspector, has been conducting apprentice classes on the code for the vocational education department of Portland public schools. Likewise, an advanced electrical code class is held for journeyman electricians and contractors. A special course was put on for the Oregon-Columbia Chapter of NECA. For both of these the question method is used to develop the thinking and analysis of specific problems by the students.

One of the finest methods of instructing anyone in the industry needing to know more about the

Answer by Code Section Numbers

Typical group of questions given to Portland inspectors to be answered at one of their bimonthly meetings:

1. Is loomwire (NM cable) permitted in unceiled basements or garages not now wired with nonraceway wiring? (Answer by section numbers.)

2. May a furnace circuit be wired in loomwire (NM cable) in an existing dwelling?

3. May a loomwire (NM cable) furnace circuit be extended directly into furnace wiring?

4. Is there a light required within 5 ft of a laundry tray?

5. May a clothes dryer be grounded other than to the neutral?

6. Does new floor area of over 500 sq ft when added to an existing dwelling have to be wired to comply with new dwellings under construction?

7. May feeders smaller than No. 8 be used to supply three 15-amp circuits per leg?

8. Do feeders for show windows have to be computed on the basis of 200 w per running foot?

9. May a new building under construction having an area of 10,000 sq ft in which the code calls for 2 w per sq ft be wired with 10- to 15-amp circuits supplying a total of 12,000 w of lighting so located as to light the entire area?

10. Does the code require capacity for small appliance loads in storage spaces for that portion over 42,000?

codes are the chapter meetings of IAEI, Gray believes. Here inspectors meet with contractors, journeymen, representatives of manufacturers of electrical equipment and utility people and field problems and questions are brought up for discussion and interpretation. Out of the field experience of these people come needs for revisions to the National Electrical Code, state and local codes. Uniformity of interpretation is fostered and this reduces the need for conflict and argument.

Joseph Gray, born in Kansas in 1896, became a moving picture operator at 17, came west to Oregon and in 1917 enlisted in the Navy. He received electrician's training at Mare Island and the submarine school at San Pedro. After World War I he entered the electrical trade as journeyman wireman, has been a member of Local 48, IBEW, for 40 years. In 1923 he became inspector in Portland and upon the retirement of L. W. Going was made chief inspector. He has been active on code committees of the Northwestern Section for many years. As president he will preside at the Northwestern Section annual meeting at the new Sheraton-Portland Hotel Sept. 12-14.

Motors and Controls—XIV

EARLY RUNNING PROTECTION TYPES

TOM HUGHES, ELECTRICAL SAFETY ENGINEER, CALIFORNIIA DIVISION OF INDUSTRIAL SAFETY

We come now to the portion that this whole series has been leading up to: the seemingly hopeless situation of large groups of starters in warm locations requiring the door to be standing open to keep the overcurrent relays from tripping. Or, on the other hand, we may find several relays with the heater elements jumpered with pieces of copper wire.

At first glance the situation seems a simple problem like the fuse panel with pennies back of the fuses. But there is nothing simple about it. We used to tune up the old Model T Ford with a pair of pliers, screwdriver, and the combination tire and sparkplug wrench. We all know that tuning up a modern car requires complex test equipment and a trained operator. The proper co-ordination of motor, load, and running protection involves study and concentration just as does the engineering of the modern automobile.

We said there are hundreds of different models and styles of motors in the complete catalog and there are likewise dozens of different models of running-overcurrent relays. But just as the countless types of motors are fashioned around a few well known fundamentals, the many model numbers of overcurrent relays are tailored around three or four means to an end.

Most of them are variations of the thermally actuated bimetallic contact arm. The main virtues of this system are: (1) foolproof duplication of performance; (2) nondestruction of any portion of the linkage; (3) and the matching of its current-versus-heating curve to that of the motor winding it is to protect. This, of course, is a very general statement that you may class as purely wishful thinking by the time we have considered all the bugs. But, to dispel any misinformation or prejudices we may be harboring, let s quickly review the evolution of the devices we use today.

The first running protection depended on opening of soldered junctures that had to be replaced like fuses. Then came the earlier bimetallic relays with resettable linkage but they were too easily tampered with. Today's bimetallic detlectors can not be readily altered from their characteristic with ordinary tools and they do not deteriorate with continual heating to the extent the older relays did.

Another popular adaptation of melting solder has been the "solder-pot" relays. After a proper interval of cooling (freezing) of the solder around a revolving shaft, the relay could be reset by compression of a spring as the control circuit contacts were re-engaged. Thus, the held shaft in the solder pot was always trying to rotate under spring tension and allow the contacts to open.

The weak point of this system was that it couldn't be properly reset unless the solder was given its required time interval to freeze. An impatient machine operator would push the reset button just as the solder was starting to set up around the burred shaft. The shaft would turn and the burrs would tear out channels in the soft solder, just as it froze. The channels remained and the shaft just continued to turn every time the reset button was pushed. Thus the contact linkage could not be held reclosed.

The only means of salvaging the relay was to take the "pot" out and remelt the solder with a blow-torch, so it could properly freeze and grip the burred shaft. Machine operators, interested in loafing, could soon figure out how to mess up this setup and wait for the maintenance man to get them going again. This has all changed in later years, with the development of eutectic alloys in solder. Change from liquid to solid state is extremely fast now.

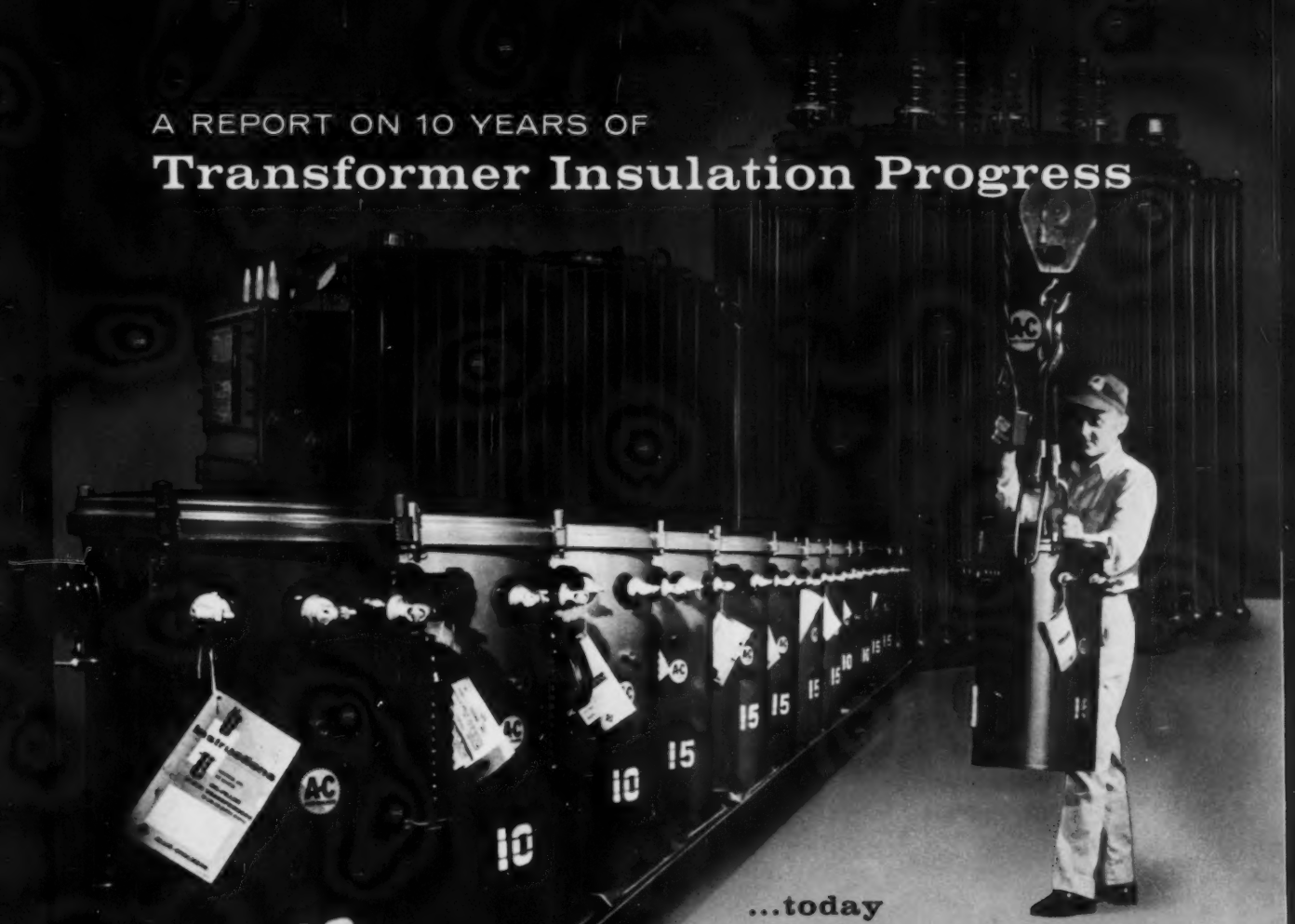
Another old stand-by was the magnetic relay. The better models were fairly complex. The armature was loaded witn an oil-filled "dashpot" that retarded its speed of travel. The dashpot piston was suspended on a hollow shaft and arranged for vertical adjustment to choose limits of travel. Within the hollow shaft was an adjustable needle valve-orifice assembly. The ease of travel (relaxation) of the piston in the dashpot could be regulated by opening the needle valve and allowing the dashpot oil to by-pass the piston through the hollow shaft. Of course, the weak point of this setup was that the viscosity of the dashpot oil changed between summer and winter or morning and night temperatures.

Where the dashpot is to be mounted in a room in which the climate is under continuous control, the "dashpot relay" is still the most versatile device (in the noncoordinated group) for motor running-overcurrent protection. Its correct use and adjustment, however, does require the attention of one who is thoroughly familiar with the many factors of motor performance and control that we have been covering thus far.

Next installments will deal with newer developments that promise answers to motor control problems.

A REPORT ON 10 YEARS OF

Transformer Insulation Progress



...today

ALLIS-CHALMERS

announces the results of this program

"Embracing all transformers from 5 kva through power transformers in the ASA standard range, this Insulation Research and Development Program, substantiated by testing of laboratory models and actual production-line transformers over the past ten years, has resulted in important benefits to you.

"These tests prove conclusively that Allis-Chalmers transformers have additional built-in capacity because of insulation principles used.

"This is why we can make public the following statement:

"All Allis-Chalmers transformers in the above ratings manufactured since January 1, 1960, are capable of delivering a twelve-percent increase in capacity at 65 C rise without loss of life."

L. W. Long, Assistant General Manager
Power Equipment Division

Allis-Chalmers will furnish upon request and without charge, supplementary nameplates showing the 65 C rating on all above transformers now in customers' hands.

ALLIS-CHALMERS

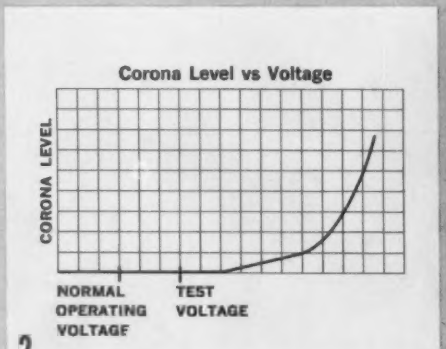
A-1351

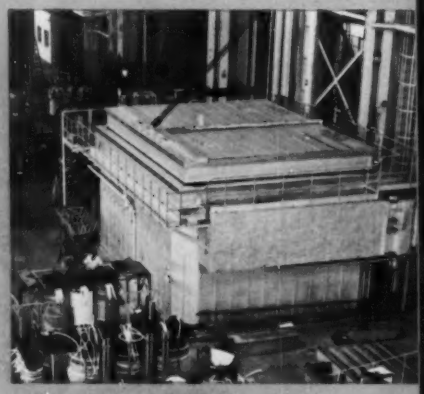
A REPORT ON 10 YEARS OF
ALLIS-CHALMERS TRANSFORMER
INSULATION PROGRESS

Proof of Transformer Endurance

Load tests on actual transformers at copper temperatures from 105 C to 230 C, running continuously for over three years, completely substantiate the 65 C rise rating when the following basic factors are employed!

3 major factors influencing Allis-Chalmers transformer endurance





1 **Thermal compatibility of insulating materials** — Investigation has shown that two insulating materials, each meeting the same rigid requirements of a material specification, will behave differently when incorporated into an insulation system. Interaction of oil and other insulating materials can improve or destroy the system performance.

Allis-Chalmers has — through accelerated tests on many laboratory models plus long-time tests on completed transformers:

a — used only basic insulating materials

b — eliminated those materials showing a basic weakness in a system, even though they meet the material specifications

c — tightened material specifications

• • •

2 **Corona-free design** — Corona, the cancer of electrical equipment, is an electrical discharge which rapidly deteriorates the system through carbonization of the insulation and thermal breakdown of the oil. Based on measuring techniques and instrumentation developed by our engineers, design criteria have been established. Allis-Chalmers transformers are designed (and substantiated by tests) to be **entirely free of corona** not only at operating voltage, but **at all test levels.**

• • •

3 **Controlled processing** — The elimination of air and moisture has a very important effect on insulation life. Tests have shown that moisture content as low as twenty parts per million can cause insulation breakdown. Allis-Chalmers transformers are processed to give completed units an uncontaminated system.

ALLIS-CHALMERS

Power Equipment Division, Milwaukee 1, Wisconsin

ELECTRICAL WEST
Construction News

For
-contractors
-consulting engineers
-lighting engineers
-wiring designers
-distributor salesmen
-all interested

ELECTRICAL CONTRACTORS DIVISION of San Diego Bureau of Home Appliances, having conducted a successful lighting course to capacity attendance, is now working on a long-range plan for an industrial electrical show to complement the division's residential wiring show during the Spring Fair. The new show would be planned as an invitational and not a public show, designed for plant managers, maintenance engineers, architects, consulting engineers, etc.

RALPH JOHNSON'S "ESTIMATIC" will be the feature of a joint meeting of the three branches of Northern California Chapter, NECA, in September in the town of San Pablo. Both the Contra Costa and Napa-Solano Branches, which are on vacation from meetings, will jein with the Alameda County Branch for that special affair. . . Supervisory training classes for job management and foremanship are being organized by the chapter to be directed by Dr. Mario Conforti during the fall.

NORMAN FERGUSON, District 9 regional vice-president of NECA, has been appointed as official host during the national convention in Las Vegas Oct. 24-27. Both convention and National Electrical Show will be held in the new civic auditorium recently completed in Las Vegas.

INTERMOUNTAIN CHAPTER, NECA, in June held a series of one-day condensed workshop-type meetings on the subject of overhead with John F. Sullivan serving as the workshop leader. . . The San Mateo County Chapter likewise held a self-appraisal workshop with Sullivan as leader during that month.

PUGET SOUND CHAPTER, to aid members in the recruiting, screening and testing of personnel other than those obtained through the unions, has appointed Northwest Career Counseling Inc. of Seattle which is doing similar work for the AGC.

A BID DEPOSITORY for Stanislaus, Toulumne, Merced and Mariposa Counties has been re-established in Stockton by the electrical industry. The Bank of America in Stockton is the depository. Administration of the depository is by E. H. Grogan, who was formerly manager of the San Joaquin Valley Chapter, NECA, and recently of Master Plumbers Assn. His office is at 1521 W. Oak St. where building registrations are made.

TO TIGHTEN LAW—California Contractors State License Law will be the subject of consideration at the 9th District Council meeting of NECA chapters to be held at Hotel El Dorado, Sacramento, Aug. 12 and 13. The Association of Electrical Workers Unions of the state is likewise seeking to have the law changed very much along the same lines discussed by

contractor groups. Those inactive in contracting would be dropped and required to give 30 days' notice for license renewal. Those who fail in business would be required to pay off labor and material debts and give 30 days' notice before again being allowed to bid on new work. Many other details of change in procedure are to be considered or submitted to the legislature.

FOR THE SUPER-CARRIER DRYDOCK at Puget Sound Naval Shipyard electrical work is being done by Holert Electric of Seattle on a contract that will run over three years in duration. The huge drydock is designed to take care of the largest Forrestal-class aircraft carriers.

A NEW ARMORY AND AUDITORIUM was to start in Salem, Ore., in July. Marion Electric Co. of that city was low bidder.

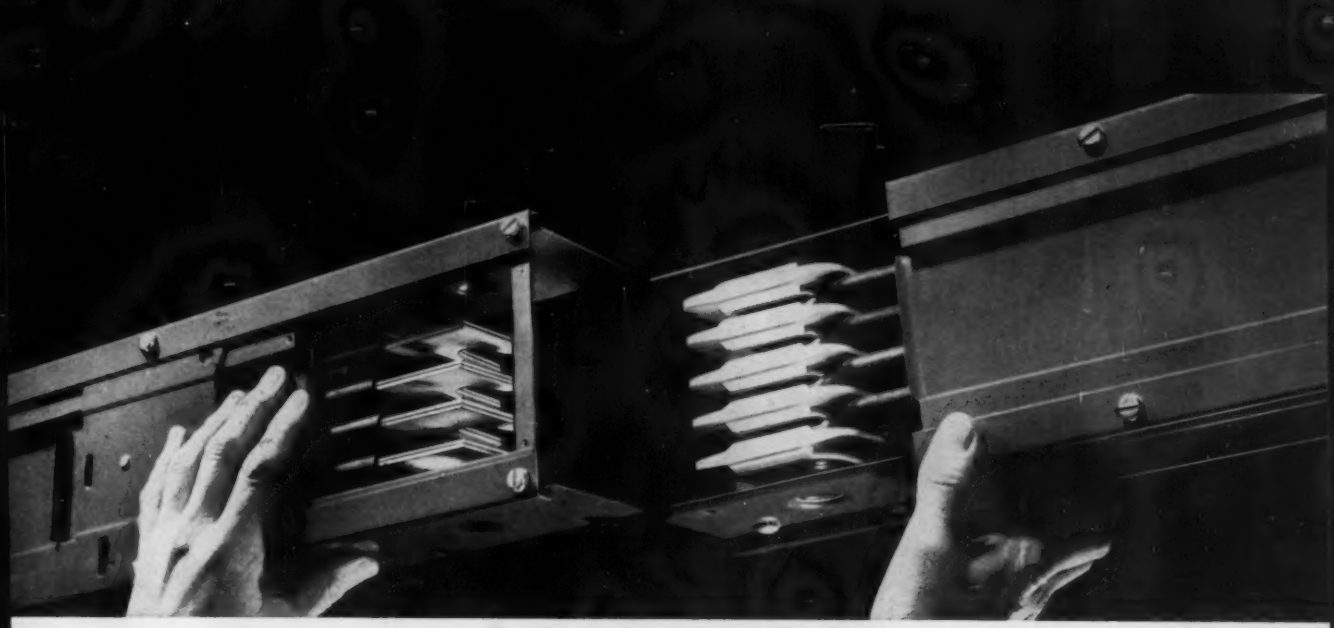
RAISE IN INSPECTION FEES proposed in San Francisco by the city's building department is being protested vigorously by the San Francisco Electrical Contractors Assn. and the industry. The increases are said to be from 100 to 300% over previous fees. A public hearing was to be held July 20.

A REVISED PROGRAM is announced by the Electrical Industry Service Bureau of Denver, which runs the electrical bid depository for the industry. As of July 11, advertisements tell the construction industry, contractors will deliver their bids direct to the general contractor with copies of all bids of $1,000 or more to be filed with the First National Bank of Denver.

SELF-APPRAISAL WORKSHOP will kick off the NECA's fall educational program Sept. 8 and 9 for the Oregon-Columbia Chapter, according to Robert Marvin of Delta Electric, education committee chairman. . . Los Angeles Chapter is offering its membership a medical insurance program, available also to employees not currently covered by hospitalization. The acceptance is a matter of voluntary action and is paid for at a group rate by the individual.

MARINE AND PARKING LIGHTING—Two new recommended lighting practices by the Illuminating Engineering Society have just been issued. They cover recommended practices for marine lighting and similar recommended practices for outdoor parking areas. They are available from IES headquarters at 50¢ a copy.

CONGRESS ADJOURNED before taking any action on the controversial bill to restore picketing on construction sites by unions. Bound to come up when Congress reconvenes after the political conventions, the subject is apt to become a big issue in the campaign. Employers in the construction industry with almost the single exception of the NECA, which is closely tied to IBEW, urged congressmen to oppose the measure. While NECA took the official position of supporting the bill, not all of its members agreed. Construction employers fear the confusion, time loss and expense that may arise from petty jurisdictional disputes over use of new materials and methods. Unions look upon it as a chance to regain "control of the work."



NEW BULLDOG XL BUSTRIBUTION DUCT

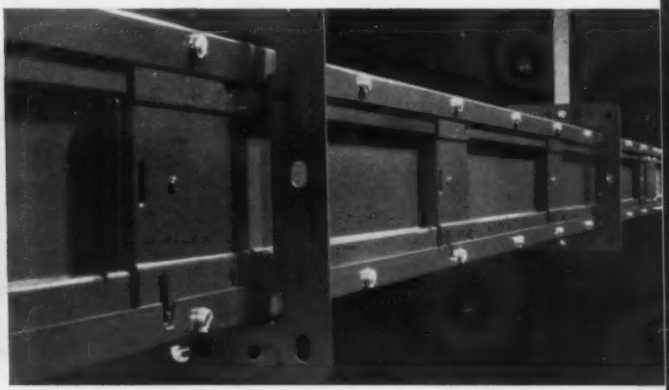
CUTS INSTALLATION TIME 3 WAYS

You can install XL BUStribution® Duct easier, faster than any other duct because of these exclusive new design features . . . plated aluminum bus bars with KEYED ENDS slip together fast, align automatically for proper position. There's no fumbling and fitting . . . ONE INTEGRAL BOLT tightens fast, locks joint positively under a ton of pressure. Bolt tightens against bus bar, not against the casing . . . TEN-FOOT SPANS take fewer hangers and less time to install than ordinary duct.

New XL BUStribution Duct is 3 ways safer, too. It's the only true dead-front duct, the only one with exclusive Safety Door, the only one with Safety Plug. And it reduces duct weight on building structure as much as 40%. Ask your BullDog distributor to arrange for a demonstration . . . you'll see how fast to install and how safe new XL BUStribution Duct really is.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

SINGLE INTEGRAL BOLT puts a ton of pressure on keyed bus ends. Joints lock tight *fast*, stay locked.



TEN-FOOT SPANS take fewer hangers and less time to install than ordinary duct.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan.
In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

Consult the following Pacific Coast representatives:

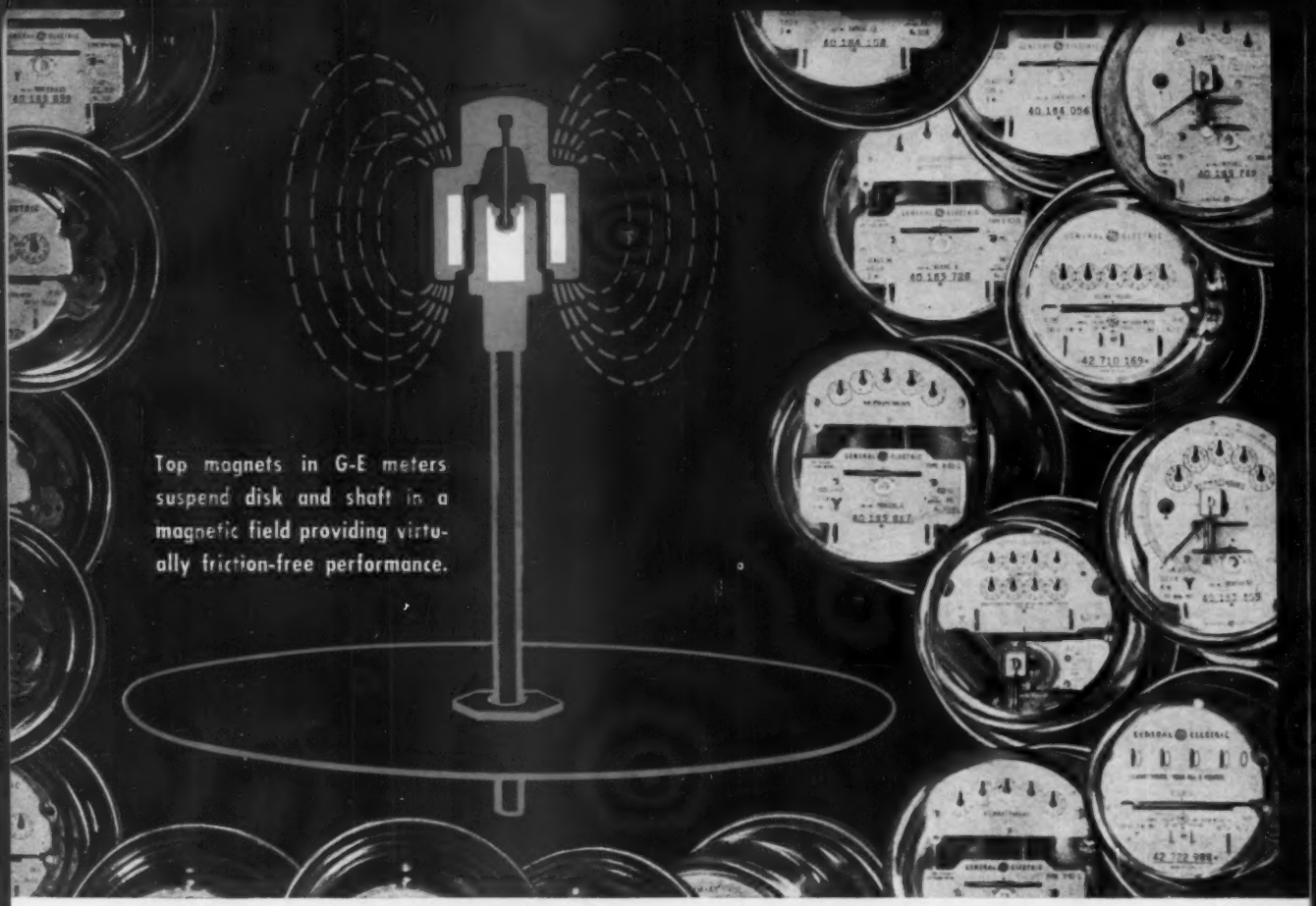
Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7866
Portland 12, Oregon

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

BullDog Elec. Prod. Co. of Los Angeles
3020 Supply Ave.
Los Angeles 22, California

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY



NEARLY

General Electric Magnetic Suspension Meters Are in Service Without a Single Bearing Failure

Since General Electric introduced the first magnetic meter-bearing system over 12 years ago, nearly 12,000,000 G-E magnetic suspension meters have accurately measured over 200-billion

12,000,000

kilowatthours of electrical energy—without one magnetic suspension system ever having been replaced because of wear. This is reliability, proved by on-the-line performance. **Contact your G-E Sales Engineer for full information or write General Electric Company, Somersworth, N. H.**

713-07

METER DEPARTMENT

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

People

James

Hugh James Joins Electrical West

The editorial staff of ELECTRICAL WEST welcomes Hugh James to the position of engineering editor.

Hugh is a native of Ashville, N. C. He left the service with the rank of captain following six years' service in the U. S. Army signal corps. His overseas duty included tours in China, India and Okinawa. After the war Hugh graduated from the University of California at Berkeley cum laude in engineering physics.

His first industrial experience was on the G-E test program, followed by service engineering and apparatus sales assignments in the San Francisco office. His most recent affiliation has been with the Anderson Electric Corp. as Western regional sales manager.

Hugh leads a busy family life with his wife Jackie and two children, Bruce and Judy, in Mill Valley. He is active in church, civic and musical groups. His hobbies include: do-it-yourself remodeling (which he doesn't like), ham radio operating, Station W6WUC (which he hasn't got time for), and once in a while a friendly game with the boys.

He is an officer and director of the Electra Navigation Co., a prominent San Francisco concern.

We can all look forward to Hugh's direction of the technical content of ELECTRICAL WEST.

► **Sally Robbins** has joined Pacific Power & Light Co.'s staff of "Polly Pacific" home economists. She will be headquartered in Yakima, where she replaces Mrs. **Shirley Farren.**

Edith Rauch Retires

Edith Rauch has retired as home service director of Puget Sound Power & Light Co., after 34 years of service.

She is a charter member of the Home Economists in Business, served as a board member of the national organization and currently is chairman of the Seattle group. She founded the Electrical Women's Round Table in Seattle.

The home service department will continue under the direction of A. B. Couch, residential sales director.

B. C. Commission Completes Reorganization

Seven key men have changed jobs and titles in a reorganization of the B. C. Power Commission at Victoria, directed toward a 15% engineer staff reduction.

John B. Hedley, chief electrical engineer, becomes consulting electrical engineer and Col. D. C. Stephenson, senior construction engineer, consulting construction engineer. Eric H. Martin will head the construction division.

Nel A. Magrath is the new chief of the electrical planning division and Eamon "Ned" Crowley takes over the program control division. A. G. Ballantyne, former major projects engineer, will be head of the civil engineering division. E. G. Tallman, who was in charge of power development, will become head of the civil planning division.

The moves are believed to complete reorganization of the commission that followed the appointment last year of Hugh L. Keenleyside as chairman.

► **E. Allen Hunter,** who joined Utah Power & Light Co. in 1937 as a "cadet," has been promoted to assistant to the president. An electrical engineering graduate of the University of Utah and the University of Michigan's utility executive school, he was staff engineer before his advancement.

► **Leo Kass,** known throughout the San Francisco Bay area as dealer relations representative of Pacific Gas and Electric Co. for the East Bay Division, retired July 1 after 46 years with the company. He began as a power house operator at the De-Sabla plant in 1914; entered sales work in 1923.

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Oceanside:	805 N. Tremont St. SAratoga 2-2141
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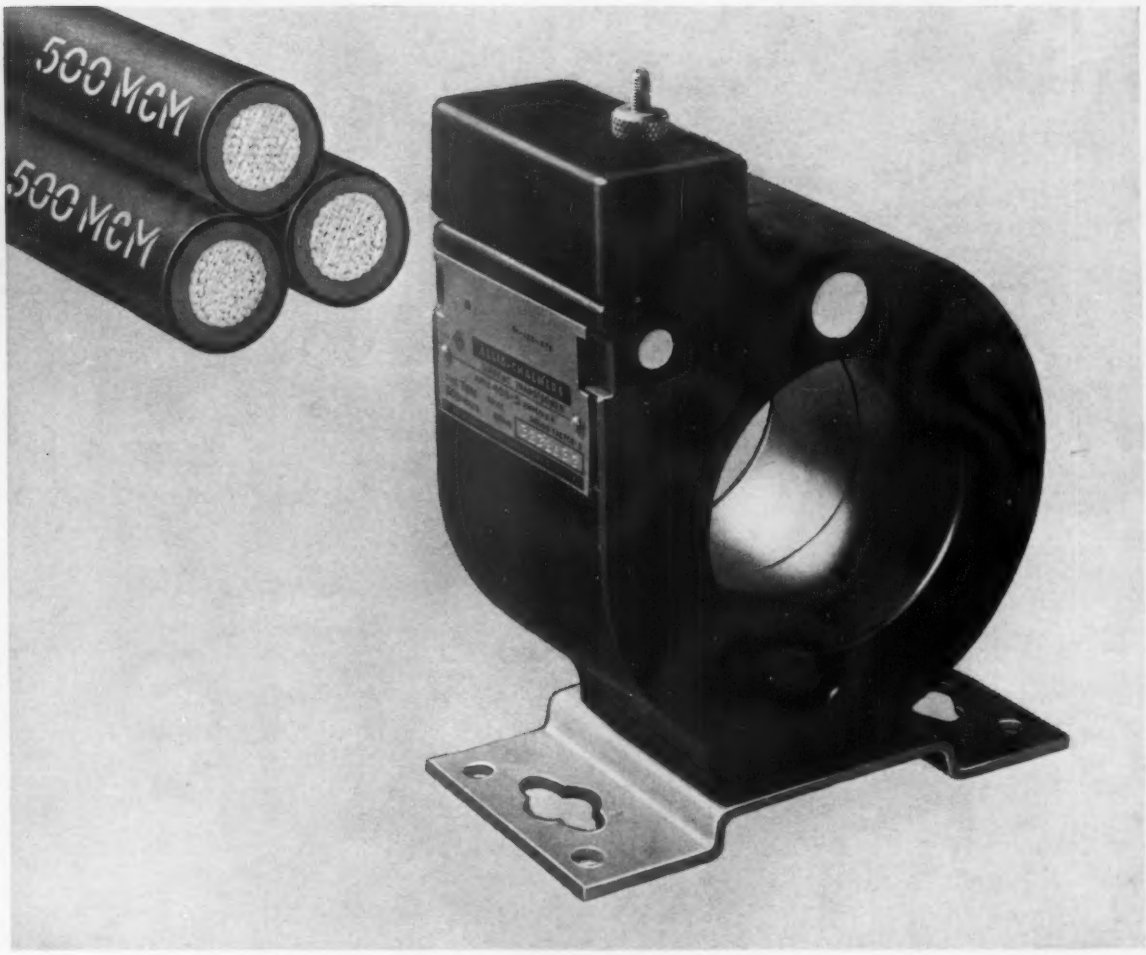

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The NEW Allis-Chalmers "PICTURE WINDOW" current transformer can easily take three 500 MCM cables.

Compact, easy to install, indestructible and weatherproof — this 600-volt epoxy-resin transformer will withstand wide temperature variations and the most severe mechanical shocks. Eliminates all possible maintenance.

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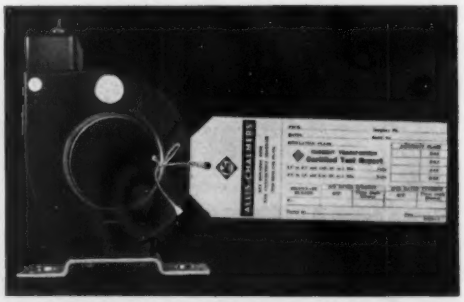
Get full details on this NEW TWM current transformer from your nearby A-C office. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

A-1310



Verified accuracy! Certified test card accompanies every A-C unit shipped. This A-C design provides ample overcurrent capacity without reduction of accuracy.

Cottingham

Hunt

PGE Promotions

Jack Cottingham was appointed PGE's commercial sales manager, succeeding Jerry Collins, whose death was reported last month. Cottingham, formerly illumination consultant for the company, has been active in IES activities and is vice-president elect of the society's Pacific Northwest region.

In another change at PGE, Jim Hunt, formerly Tualatin Valley Division commercial representative, has been made manager of commercial and industrial sales promotion. He succeeds Nick Mason, who resigned to start his own firm.

► **Pat Valentino,** who has been PGE's Tigard district manager, was transferred to Salem as Willamette Valley division sales manager. Before going to Tigard in 1959, he served as the company's commercial representative in Gresham. He has been with PGE since 1947. **Pete Perrine,** former district manager in Sandy, will replace him as Tigard manager.

Valentino

► **Everett C. McKeage,** president of the California Public Utilities Commission, was unanimously re-elected to serve for the new fiscal year that began July 1. McKeage was appointed to the five-man commission Feb. 10, 1959, by Gov. Edmund Brown, after 14 years as its chief counsel.

► **John F. Mangan** has been named area engineer for the Upper Columbia Development office of the Bureau of Reclamation in Spokane. He replaces **Charles S. Hazen** who resigned to enter private employment.

► **William T. Nordeen,** former manager of Douglas County PUD, has joined the Washington Public Power Supply System. He will supervise a power marketing study being made in connection with the proposed Nez Perce Dam.

► **Chairman James B. Black** of PG and E has accepted the chairmanship of the Western Public Utilities Committee of Project HOPE, a privately sponsored program to share U. S. medical knowledge and skills with newly developing countries. During its first year of operation, HOPE will send a floating medical training center to southeast Asia.

► **Dr. Thomas M. Snyder,** manager of physics at General Electric's Vallecitos Atomic Laboratory, has been elected chairman of Northern California Section of the American Nuclear Society. Snyder has served as vice-chairman of the group for the past year.

► **Allan W. Fox** became Puget Sound Power & Light Co.'s purchasing agent on July 1, succeeding **Luther C. McIver,** who retired following 43 years in the electrical industry. McIver started with Stone & Webster in 1917 and in 1930 was transferred to Puget Power as works auditor for the construction of the Rock Island hydro project. From 1935 until 1944, when he was appointed manager of purchases, he held a number of administrative posts. Fox started with Puget Power in 1929 and has been purchasing agent since 1943.

Fox

► **W. W. Quistorff** was advanced to Western Division manager for Puget Sound Power & Light Co., succeeding **J. Harvey Leach,** who retired July 31. A graduate of the University of Washington in electrical engineering, Quistorff joined Puget in 1928. Before his promotion he was superintendent of light and power for the Western Division.

Quistorff

► **Howard M. Crinklaw** has left Quinault Light Co. to go to the city of Nome, Alaska, as manager of the electric facility.

► **Frank M. Warren Jr.,** president of Portland General Electric Co., has been re-elected to a six-year term as a trustee of Reed College, Portland.

► Election of **Don C. Frisbee** as vice-president and treasurer of Pacific Power & Light Co. was announced by Chairman **Paul B. McKee** following a directors' meeting. The appointment followed retirement of **George F. Mackenzie** as vice-president and controller. Frisbee, who has been treasurer since September 1958, joined PP&L in 1953. Previously he was a senior investment analyst and assistant cashier for the First National Bank of Oregon. After military service in World War II, he was graduated from Pomona College and in 1949 received his master's degree in business administration from the Harvard Graduate School of Business.

Frisbee

New Operating Setup

San Diego Gas & Electric Co. has announced changes in organization of its operating division to be effective upon completion of new headquarters now under construction.

The various departments of the operating division will be regrouped in three sections: production and transmission, distribution, engineering. Executives in charge will be W. A. Zitlau, manager of production and transmission; C. P. de Jonge, manager of distribution; and J. F. Sinnott, manager of engineering. These men will report to H. A. Noble, vice-president, operation.

Hugh Stewart, executive engineer, will continue to have direct supervision over insurance, safety and claims, purchasing, research and tests and library departments, and will serve as consultant on engineering problems.

► **Charles R. Day** has been promoted to the post of chief electrical engineer for Sacramento Municipal Utility District. Day, who started with SMUD in 1946 as an electrical engineer, formerly was with the Los Angeles Department of Water & Power, Modesto Irrigation District and Turlock Irrigation District. He will be in charge of SMUD's 26-man engineering department.

Day

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Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

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► **V. R. Knight,** known as "Pink" because of his once red hair and always red fountain pen ink, retired completely from California Electric Works in San Diego after 40 years with the organization. During that time he served as its president and manager and, in recent years, as its public relations representative. He sold his last stock interest to the company earlier this year. The company began in 1920 as a cooperative partnership of eight partners, which later became a corporation.

► **Roy Stephens** succeeds the late Oscar Carlson as Lander manager for Pacific Power & Light Co. Stephens joined PP&L in Washington in 1952 and was later transferred to Oregon. At the time of his promotion he was commercial sales representative in Casper, Wyo.

► **Frank W. Bird,** chairman of Montana Power Co.'s board of directors, marked his 50th anniversary with that company on June 25. At a recent board meeting, directors expressed their appreciation to him for "50 years of outstanding service as an employee, executive, officer and director." They passed a resolution commending his brilliant leadership and expert assistance to the board.

► **Creighton Johnson,** manager of the Emigh Hardware appliance department in suburban Country Club Center, has been elected president of the Sacramento Valley Electrical League. Johnson succeeds Russell Tatro. Other new officers are Myles Myers, vice-president; Harry O'Laughlin, secretary-treasurer; John Helms, Richard Taylor, John Clayworth, Keith Anderson, Roy Schoffstoll and John Pineau, directors.

► FPC has appointed **John R. La Camera** to the post of regional accountant in its San Francisco regional office.

► **George Huster,** Walla Walla district power superintendent for Pacific Power & Light Co., has been made assistant supervisor of meters, relays and communications at the Portland office. He is being replaced at Walla Walla by **Fred Rowell,** district power superintendent at Kalispell, Mont.

► **Lord Plowden,** former chairman of Britain's Atomic Energy Authority, has been made a director of the B. C. Power Corp., according to Chairman A. E. Grauer. He succeeds the late E. Ronald Crammend.

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Fine Fanner Superformed Products

"Superforms* help us clip in transmission lines Better, Faster, for Less"
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"When we bid on a T&D job, we have to figure *cost, speed, quality* and a *fair profit.* Since we started using Superforms, we've eliminated many former errors and inconsistencies in practices.

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Successful Contractors are the men who can build TOP quality at LOW cost. From coast to coast they are switching to Fanner Superforms. A-1604A

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Protect long-span T&D lines at supports

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Repair damaged conductors

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Join two ends of conductor wire

PLASTIC PRODUCTS...
For conductor surface protection

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► **Albert W. Bruce,** PG and E supervising mechanical engineer, represented the United States at a UN conference on geothermal energy held in Rome June 27 to July 2. He is the designer of the company's geothermal power station nearing completion at The Geysers near Healdsburg.

Deaths

► **Virgil A. Nahl,** 61, a member of Hawaiian Electric Co.'s promotion department, collapsed and died in his office. A native of San Francisco, he had been with Heco since 1927.

► **Willard Gilbert Sawyer,** former president of the John C. Virden Co., died June 19 at his home in Atherton, Calif. An early leader in the Lighting Equipment Manufacturers Assn., he was a founder of the present American Home Lighting Institute.

► **Robert Nevins,** 64, general manager of the major appliance and TV department for ZCMI Department Store in Salt Lake City, died recently at his home.

► **Charles E. Armstrong,** 71, engineer and inventor, died June 26 in Portland. He was president and chief engineer of the C. E. Armstrong Co.

► **Claude R. Lester,** 71, electrical engineer and retired chief of Bonneville's rate and statistics department, died in Portland June 26. He was to have consulted early in July with Canadian power authorities on rates for the Peace River project. A graduate of the University of Michigan, he served with the U. S. Army Engineer Corps during World War I and later came to Oregon to work with the Public Utilities Commission as chief engineer, position he held for 18 years. He then went with FPC in Washington, D. C., for a few years before joining Bonneville in 1945. A new power rate that he developed bears his name.

► **John Graff,** 68, former owner and operator of Seward Light & Power Co. at Seward, Alaska, died in Seattle July 5 after a long illness. He was a lighting specialist in that city for G-E until 1936, when he went to Alaska to take over management of the power company established by his father. He retired in 1942.

► **Orville A. Alderman,** 63, who retired in 1959 as Western division manager for Bussmann Mfg. Co., died July 12 in Oswego, Ore.

Wire conduit the **JET LINE** way

You can pull wire in minutes instead of hours using the Jet Line Method*. Contractors everywhere are doing it, and saving up to $40 per day or 70% of wire-pulling costs!

The Jet Line Method—Gun, Cylinder, and Poly Rope—provide the fastest, easiest, safest means of wiring conduit ever invented. Ask your wholesaler for a demonstration, and see for yourself how you can make money by saving countless hours on wire-pulling jobs... with Jet Line. Low-cost Starter Kits available.

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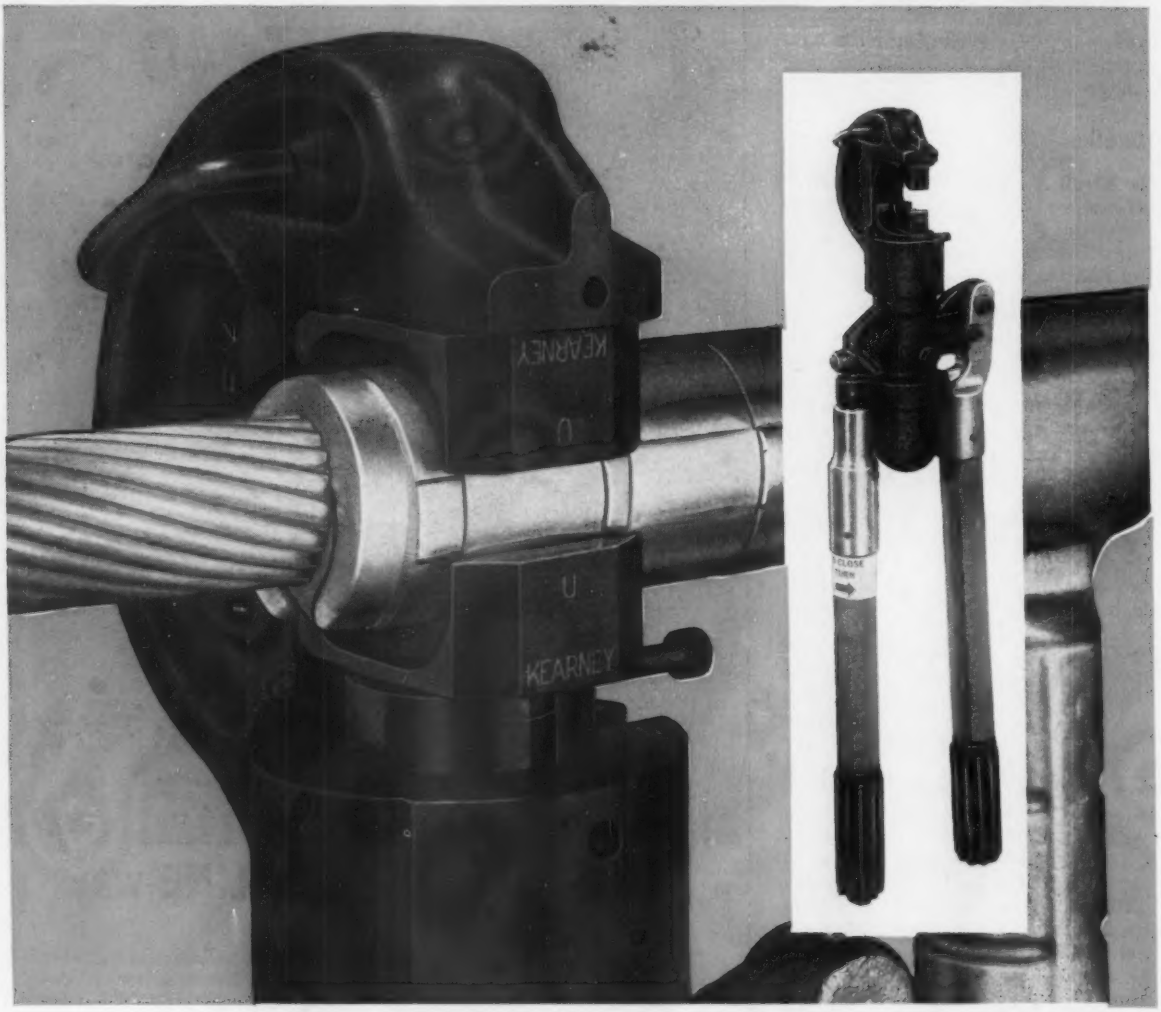
KEARNEY WH-2 HYDRAULIC TOOL AND



This is the tool... Kearney does it again! The Kearney WH-2 Hydraulic Tool—big brother to the WH-1 Tool—is the FIRST and ONLY portable, hand-operated, hot-line compression tool to accommodate such a wide range of fitting and conductor sizes. Equipped with only this ONE tool linemen can now install tap compression connectors on all sizes of energized and non-energized conductors from #6 Solid through 636 MCM ACSR! Die sizes are the same as those for the Kearney WH-1 Tool, plus the additional sizes required to install the larger fittings shown on the opposite page. Dies snap in or out easily . . . can be secured with a set-screw. A two-step, high speed pump generates full 21,000 pounds of thrust. An automatic overload valve prevents over-compression. Large C-frame head allows clear view of work area while making indents. A partial rotation of one handle sets tool to compress or retract dies—no need to remove either hand from handles. Interchangeable insulated handles are available in various lengths to adapt tool to individual voltage requirements.

In the West: For further information, contact your Kearney West Coast Distributor
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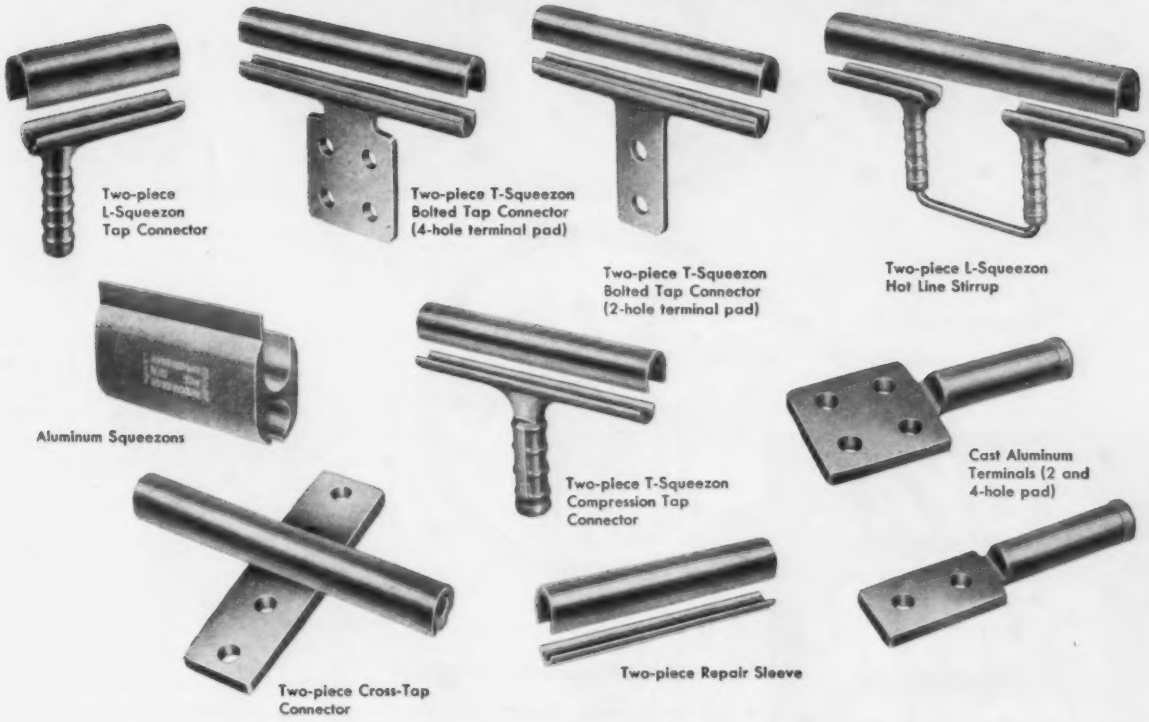
2-PIECE COMPRESSION CONNECTORS

. . . extend the connection range to include installations on all "Hot" or "Cold" lines from #6 Solid to 636 MCM ACSR


Two-piece L-Squeezon Tap Connector
Two-piece T-Squeezon Bolted Tap Connector (4-hole terminal pad)
Two-piece T-Squeezon Bolted Tap Connector (2-hole terminal pad)
Two-piece L-Squeezon Hot Line Stirrup
Aluminum Squeezons
Two-piece T-Squeezon Compression Tap Connector
Cast Aluminum Terminals (2 and 4-hole pad)
Two-piece Cross-Tap Connector
Two-piece Repair Sleeve

These are the fittings... New, larger Kearney tap connectors and the Kearney WH-2 Hydraulic Tool now extend the tap compression connection range to include installations of highest electrical efficiency on energized or non-energized conductors as large as 636 MCM ACSR. Kearney two-piece aluminum tap connectors accommodate large conductor sizes from 266.8 MCM through 636 MCM ACSR. Tap units slide into and interlock with an encircling sleeve unit. Sleeve for any one conductor size will accept interchangeably various tap units of the same size range. Kearney interlock design aids installation . . . insures uniform compression and full-circumference contact . . . eliminates strand cutting. Sufficient connector mass without excess weight assures cool-running connections. Interchangeability of tap units helps reduce storekeeper inventories.

Also illustrated: Kearney Cast Aluminum Terminals, accommodating wire sizes from #2 ACSR to 1000 MCM Str.; Aluminum Squeezons for wire sizes from #6 Solid to 397.5, line or tap.

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. . . the all-quality line of all-purpose heavy-duty extensions

Here's the kind of rugged construction that pays off on the job: MOLDED-ON caps and connectors, — built-in strain reliefs — Royal-quality cord — heavy brass blades and double-wipe contacts — locked-in-place molded construction . . . and FULLY UL LISTED!

Next time you're ordering electrical supplies from your wholesaler, be sure to include Royal "POWR-KORDS".

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Manufacturers—Distributors

Harvey May Build New Northwest Plant

Harvey Aluminum Inc. is reported to be negotiating for a substantial share of the 300,000 kw of federal power being offered to Northwest industries. The power would be used for a new aluminum plant equal in size to the one at The Dalles.

Negotiations have been in progress between the Bonneville Power Administration and Harvey Aluminum on a long-term contract for the power. Discussions have centered about 60,000 to 75,000 kw of firm power and an additional 95,000 kw of secondary power.

No location for the plant has been decided upon, it was reported. The company is weighing the advantages of locations both in Oregon and Washington.

Harvey is now expanding its production capacity at its plant at The Dalles by 25%. At that location, the company receives an at-site rate of $14.50 a kw-year because of its proximity to The Dalles Dam.

► **Square D** Co. has established a resident field office in Great Falls, Mont., at 2012 19th Ave. S. **Bob J. Hodges,** who had been employed at Seattle since 1956, is resident field engineer. Telephone number of the new office is GLendale 2-6082.

► **H. K. Porter** Co.'s Delta-Star Division has sent its lightning arrester seminar on a nation-wide tour. Conducted by H. R. D. Biecker, product sales manager, and F. G. MacRae, lightning arrester specialist, the seminar deals with theories of lightning and its effect on electrical distribution systems, arrester designs and functions and takes a look into lightning arrester protection methods for the future. A 30-minute talk is followed by a half-hour open discussion for questions and answers.

► **Yuba Consolidated Industries,** Richmond, Calif., plant, closed for a year, is being reopened for steel fabricating and manufacturing operations, according to President **John L. McGara.** The 105,000-sq-ft plant at Barrett and A St., formerly known as Calsteel, will operate as Yuba Mfg. Division, Plant No. 2, Richmond. **Edwin J. Block,** Yuba factory manager at Benicia, will also manage the Richmond operations.

Plant Addition

Alwalt Mfg. Co. has completed a 20,000-sq-ft addition to its Modesto, Calif., office. Al Johnson, president of Alwalt and Circle A-W Products, is shown in his new office, a part of a 3,200-sq-ft addition to the general office area. At left, a specially constructed extension to a fork lift helps handle the new four-tier warehouse rack in the warehouse section. Also housed at the addition is a meter department and printing operation

►**LAM structural lighting** has appointed Jim Shirreffs Co. as its representative in southern California. Excluded from his territory are San Diego and Imperial County from Los Angeles.

► **Capital Wholesale Electric Co.** assumes new ownership as Elmore Duffy purchased the interest of George Morrow in the company. Duffy becomes president of the company in Sacramento.

► **Supa Insulations** Inc. has become a wholly owned subsidiary of **Superior Cable** Corp. Supa specializes in the manufacture of Teflon insulated wires and cables, which will continue to be marketed under its name.

► **Ralph A. Blakelock,** appliance sales manager for Frigidaire's Dayton sales branch, has been named assistant manager of the company's Los Angeles branch. He has been associated with Frigidaire since 1936.

► **Fanner Mfg.** Co. has appointed Smith Sales Co. of Albuquerque, N. M., as its sales representative for New Mexico and El Paso County, Texas.

► New sales representative for **John E. Fast** & Co. in the northern California territory is **Long & Associates,** 505 Middlefield Road, Redwood City.

► **Dennis Wilson** is a new **Line Material** field engineer serving the Butte, Mont., area.

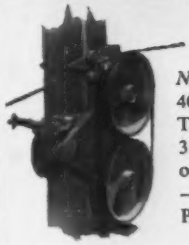
► Office of **BullDog Electric Products** in Los Angeles has been moved from 2885 E. Washington Blvd. to 3020 Supply Ave., Los Angeles 22.

► **Daystrom** Inc., Weston Instruments Division, has opened new district sales office and service facilities at 1125 Marshall St. in Redwood City, Calif. **Herman E. Held,** who has handled Daystrom sales and service in the Golden Gate area for more than 20 years, will be district manager.

► **California Wholesale Electric** Co. has been appointed special distributor for **Tork** time switches. Standard units may now be ordered direct from that company at 2548 South Yates Ave., Los Angeles.

NEW

PENGO POLE-MOUNT TENSIONER



Now...PENGO 4000 Tensioner Takes Conductor to 336,500 cm-ACSR or 397,500 cm-AAC —Tensions to 1,000 Pounds!

Here's a bullwheel tensioner you can carry in every line truck! It features two 18 inch neoprene lined bullwheels. Tru-Stop disc brake — yet weighs so little it's truly portable.

Two men can easily place the 4000 PM against the pole, attach it (chains and wing-nut tightener are permanently attached to tensioner), and start stringing in a matter of minutes. Conductor can be payed off any suitable reel stand. A collapsible reel attached to a winch shaft makes a practical puller, although any type of power previously used for pulling can be used.

TENSION WIRE STRINGING is the safe, economical modern way to string distribution and transmission lines. Why not get the facts? Write for new PENGO catalog TSE-1 for full data on the world's largest, most complete line of tension stringing equipment. Please address Dept. 34.

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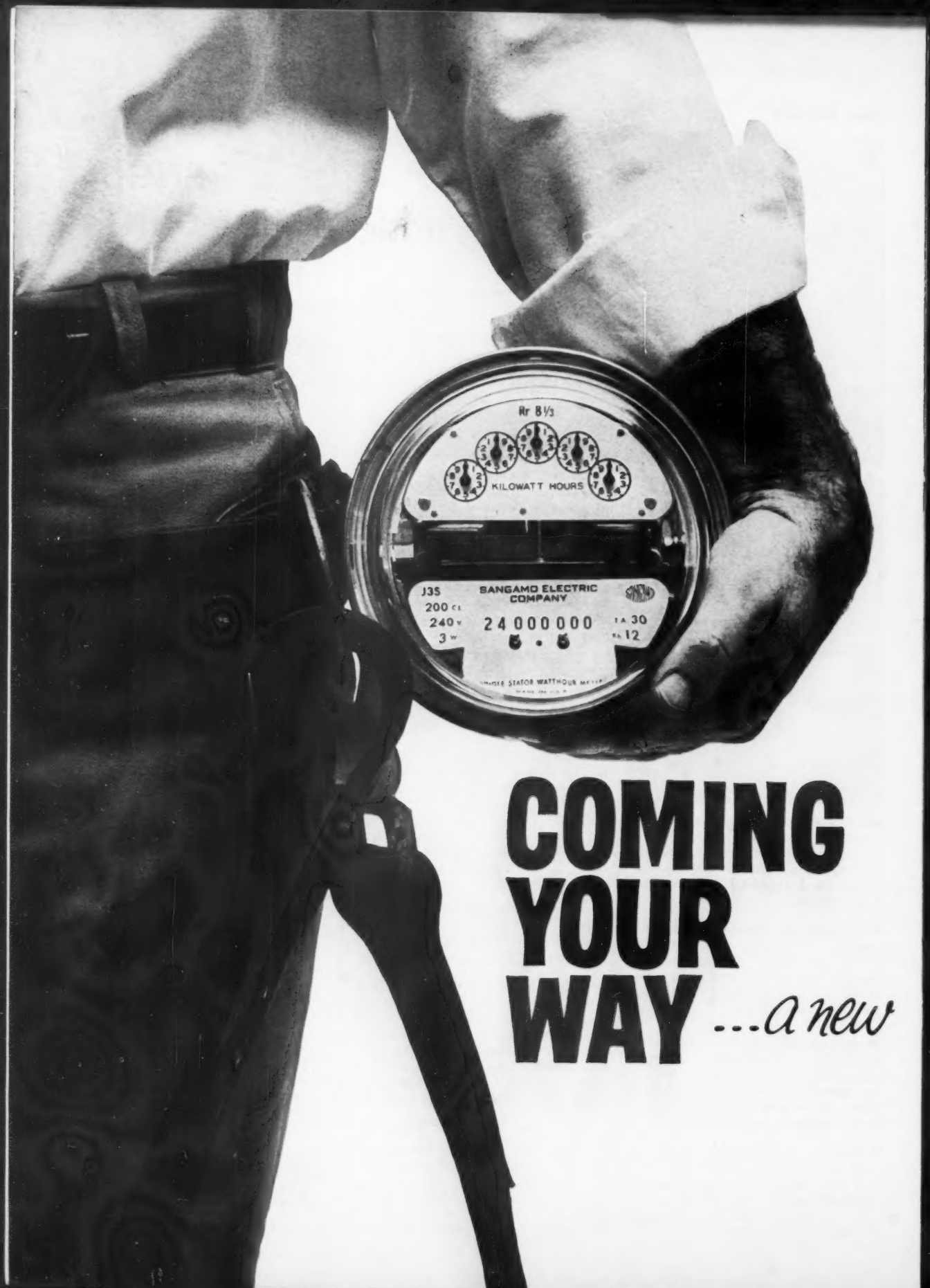


COMING YOUR WAY ...a new

THIS IS THE ONE, developed to meet your needs . . . the Sangamo J3 Singlephase Watthour Meter. No warmed over, weary, compromise copy this. No follow the leader, last-with-the-least version of any other meter in the world. This is the J3 . . . the only meter with true magnetic flotation. The one new, noteworthy development in watthour meters this year. One of the exceptional advances in metering in any year!

The Sangamo J3 has these new features:

TRUE MAGNETIC FLOTATION . . . the moving system of the J3 is not suspended, supported, harnessed or trapped. It floats, pure and simple, permanently and without friction, on a field created by Alnico magnets that are dimensionally and magnetically uniform.

VISIBLE, SELF-CLEANING GAP . . . because the magnets repel each other, the gap stays clean; it cannot be bridged by metal particles.

CONTROLLED FLOATING SYSTEM . . . in the J3, endshake is controllable to assure best performance on high loads. The dual damping magnets in the J3 substantially reduce side thrust, and tilt-error is insignificant. These features, combined with the unique slow speed of Sangamo J Meters, give you a moving system that is *guaranteed for life.*

ADVANCED INSULATION LEVEL . . . Epoxy-coated current coils, proven on Sangamo polyphase meters, provide better insulation, facilitate heat dissipation.

SMALLEST SIZE . . . the J3 is smaller than other meters, making it easier to handle.

NEW DESIGN . . . provides better visibility for inspection and testing.

Plus these traditional Sangamo advantages:

HIGHEST TORQUE . . . up to 15% more than that of any other meter.

SLOWEST SPEED . . . 40% fewer revolutions than any other meter.

LOWEST STARTING WATTS . . . starts to operate before any other meter; requires 25% fewer starting watts to begin measuring; total watts loss is lower.

SECTIONALIZED CONSTRUCTION . . . any component can be inspected and replaced without completely disassembling the meter. Many parts are interchangeable with J and J2 meters.

CORROSION RESISTANT FINISHES & MATERIALS . . . end maintenance problems caused by weather and atmospheric conditions.

GLASKYD BASE . . . with tremendous impact strength that shrugs off rough treatment. Has better arc tracking resistance, too.

Your Sangamo Representative is coming your way with a sample of the new J3. Probe, pry, pore over it. Write it into your standards. Then, put it to work . . . for this has everything you want in a watthour meter. And that's a promise, for this is one of the really great ones.

watthour meter . . . the Sangamo

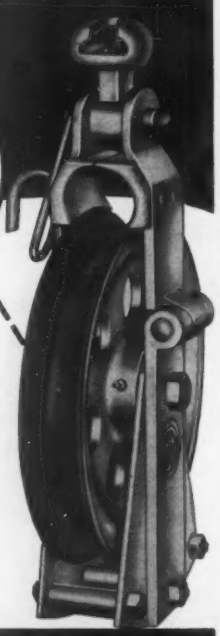
true *MAGNETIC* flotation

J3

SANGAMO ELECTRIC COMPANY / SPRINGFIELD, ILLINOIS

JM60-5

Now, Conductor Stringing Sheaves
WITH PERMANENTLY BONDED
TYPE GNA
NEOPRENE
LINING



Molded by a vulcanization process under heat and pressure on specially designed machines.

Lining is **permanently bonded.** Has uniformly excellent properties for resistance against abrasive wear from wire rope pulling lines and deterioration from lubricants.

Proven by extensive laboratory and field tests.

All S&R Conductor Stringing Blocks, sizes 7" through 28", are available with Type GNA Neoprene Lined Sheaves.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
1st and Broad Streets • Chattanooga 2, Tennessee
Telephone AMherst 7-1273 • Teletype Exchange CT-7036

Keeping line clearance costs DOWN goodwill UP

Proven power equipment and Davey trained rope climbers . . . that's what makes Davey Surgical Line Clearance so economical. Utilities can rely on the dependable, efficient, and *adaptable* Davey crew. It will pay you to talk over your tree maintenance problems with the West's leading line clearing specialists—Call Davey.

DAVEY
TREE SURGERY CO., LTD.
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SAN FRANCISCO • Russ Building
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Hedrick

Sturman

Hedrick to Manage Sunnyvale Operation

Westinghouse has announced top executive changes in its Pacific Coast manufacturing and repair organizations.

Larry E. Hedrick, who has been Pacific Coast regional manager of the Manufacturing & Repair Division since 1955, has gone to the Sunnyvale Manufacturing Division as manager, succeeding James S. Hagan, who became assistant to the vice-president, apparatus products.

Hedrick's post as M&R regional manager has been taken over by Brian J. Sturman Jr., who was replaced as manager of the Compton plant by Rhule L. Bell. Hagan, who had been Sunnyvale manager since 1957, will continue to make his headquarters there.

► **Alcoa** has consolidated its research, development and sales efforts for aluminum sheet and foil strip electrical conductors with a similar program conducted by its subsidiary, **Rea Magnet Wire Co.**

► **Bob Hart** has been appointed marketing manager of the West Coast Division of Cornell-Dubilier Electric Corp. West Coast sales manager for the Tobe Deutschmann Corp. for three years prior to his new appointment, Hart will headquarter at Cornell-Dubilier's Venice, Calif., plant.

Hart

► **D. B. Kitchel** has been made assistant general purchasing agent for Kaiser Steel Corp., with headquarters at the company's Oakland, Calif., plant. For nine years he has been purchasing agent at the Fontana, Calif., works.

► Acquisition of **Dallons Laboratories** of Los Angeles was announced by **International Rectifier Corp.** of El Segundo.

Ferguson

Maier

► Two executive appointments were announced by the Electrical Conductor Division of Kaiser Aluminum & Chemical Sales effective July 1. **J. Carl Ferguson** has been named director of electrical conductor marketing and **Cornell C. Maier** succeeds him as division general sales manager. Both men will be headquartered at Oakland, Calif. Ferguson, a graduate of the U. S. Naval Academy, served for five years in engineering and sales positions with RCA and FT&R Corp. before joining Kaiser Aluminum at Kansas City. Maier had been serving as Los Angeles district manager for the Industrial and Metals Divisions.

► **Clarence W. Higbee,** assistant general manager of Kaiser's Electrical Conductor Division, retired on July 1. A dinner in Oakland, Calif., attended by employees and division executives, honored his long service to the industry.

► Alcoa's Rome Division has transferred **L. R. Hennings** to its Spokane branch sales office, replacing **W. A. Carleton.** Carleton, who has been at Spokane since 1958, will move to Pittsburgh headquarters to join the structural division. Hennings has been in the Seattle sales office since 1957.

Hennings

► **United Centrifugal Pumps** has moved from Oakland to a new plant in San Jose, Calif.

► **Robert V. Mourer** has been appointed district service engineer for the newly organized Denver sales district of Babcock & Wilcox Co.'s Boiler Division. From headquarters in the company's office at 1806 Tower Bldg. in Denver, he will direct activities in a district comprising the States of Colorado, Montana, New Mexico, Utah and Wyoming and parts of Idaho, Nebraska, Nevada, South Dakota and Texas.

► **Gene H. Walter** has been transferred from Alcoa's New Kensington, Pa., works to Vancouver where he will be assistant fabricating works manager. He replaces **Lawrence W. Meyer,** who is being transferred to New Kensington as assistant works manager.

► **A. R. Brown,** specialty sales supervisor for Westinghouse Electric Supply So. in Spokane, was transferred to Seattle June 1 as district specialty sales manager. **H. F. Lamb,** credit manager at Spokane, has retired and has been succeeded by **Darrell Syler.**

► **Atomics International** is now located at 8900 DeSota Ave., Canoga Park, Calif. Mailing address remains: P. O. Box 309, Canoga Park.

► **Donald J. Hawes** is the new area manager for Westinghouse Electric Corp.'s Central Pacific District Apparatus Marketing Division with responsibility for the electric utility group. He succeeds **David F. Roach,** now manager of Oregon apparatus marketing. Hawes was apparatus sales engineer in Portland until 1956, when he was transferred to the San Francisco utility group as sales engineer.

Hawes

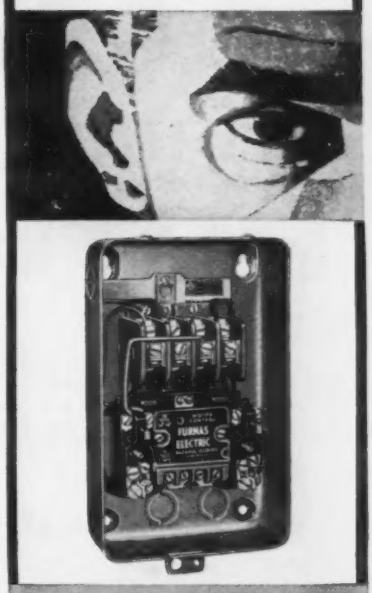
► **Franklin P. Hogan** has been transferred to San Francisco as branch manager for Westinghouse Electric Supply Co. He joined Wesco as a sales trainee and was sent to Omaha in 1956. Before his present appointment, he was apparatus and supplies sales representative in Omaha.

► S&C Electric Co. has named **Fred A. Allehoff** as its sales engineer for Oregon, Idaho and Montana. His headquarters will be in the Weatherly Bldg., 516 S. E. Morrison St., at Portland. Allehoff has had 12 years' experience in application of high-voltage, circuit-interrupting equipment and is a registered professional electrical engineer in Oregon.

Allehoff

SEE FOR YOURSELF

Sound engineering and field testing are built into the advanced design of all Furnas Electric products, to provide the leading motor controls on the market today.

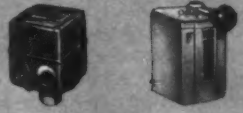


• Standardized design and exclusive "in-between" starter sizes allow wider application with fewer units.

• Magnet features just one moving part. Dual voltage coils, 110-220 or 220-440 volts at no extra cost.

• Trip-free thermal overload relays. Manual or automatic reset.

• Non-tracking contact block is impact resistant. Visible and front removable silver-cadmium oxide contacts.



SEE FOR YOURSELF! Write today for Bulletin 14-B1 — 1082 McKee Street, Batavia, Illinois.

A86

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FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in All Principal Cities

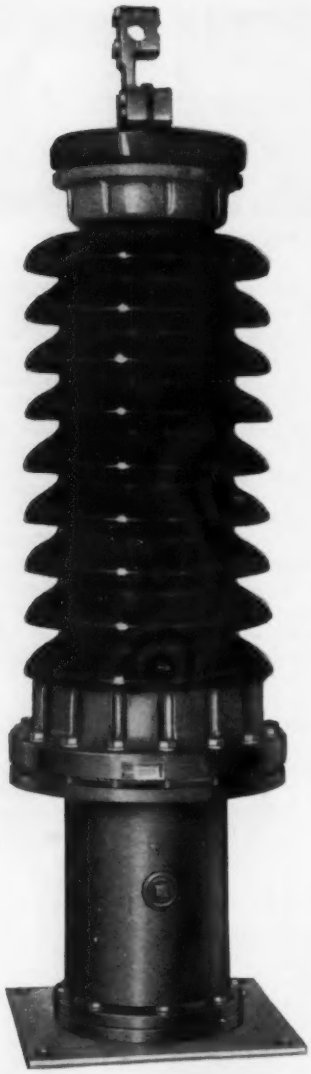
Improved

G&W

High Voltage

POTHEADS

offer simplified design; lower cost



Simplification of G&W's original Type AT pothead design has resulted in lowering costs of the new high voltage pothead line, ATA-N and ATL-N. The outstanding mechanical and electrical characteristics which have been responsible for the fine performance of the original Type AT potheads have been retained. Maximum interchangeability of parts is one of the advantages gained by the simplified design. Also, the use of a straight-through type ferrule provides a more stable connection to the overhead line.

A new means of retaining gaskets is a definite improvement in sealing against high pressure. Successful tests up to 750 psig of hydrostatic pressure indicate that these improved G&W Potheads have superior performance characteristics under operating static heads in excess of 200 psig (nominal).

Type ATA-N and ATL-N potheads are another example of the constant improvement being made in G&W products. Their performance and dependability is based upon G&W's thorough understanding of electrical and mechanical requirements for cable accessories gained from 55 years of engineering development, testing, and operating experience. Consult with a G&W Representative on your present and future cable termination needs, or write us for full information.

G&W ELECTRIC SPECIALTY COMPANY

3506 WEST 127th STREET • BLUE ISLAND, ILLINOIS

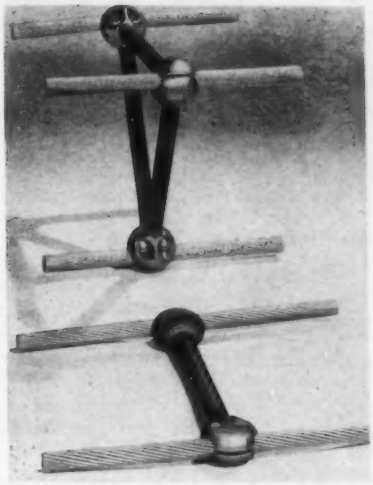
CANADIAN MFR. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards — inspired specialized design

AT60-1

PRODUCT NEWS

New Designs and Applications



Spacers

(1) *Aluminum Co. of America, Rome Division,* 1501 *Alcoa Bldg., Pittsburgh* 19, *Pa.*

Hamburger Bun is the descriptive name given to a new spacer for bundled transmission conductors by its manufacturer. This nickname comes from the appearance of two oval clamps at either end of the spacer's helical spring body.

According to the manufacturer, design of the new spacer gives column strength to resist short circuit forces and great flexibility in other directions to permit normal conductor movement. It incorporates a stainless steel spring, separating cast aluminum clamps.

A variant design is a "tri-spacer," using the same type of helical spring component, with spherical clamps.

Tubing

(2) *Sequoia Wire & Cable Co., Subsidiary of Anaconda Wire & Cable Co.,* 2201 *Bay Rd., Redwood City, Calif.*

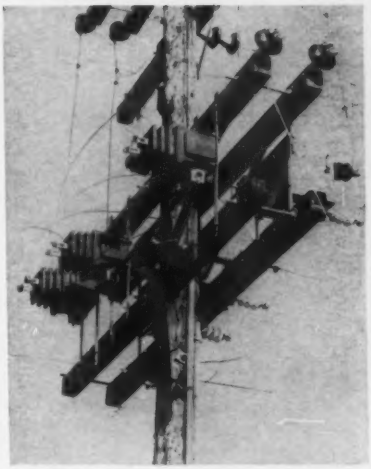
A new polyolefin tubing and sleeving material is said to heat shrink in diameter to form a tight bond, even over irregular shapes. Designated Hyshrink, the new tubing is flame retardant and thermally stable and can be slipped easily in its expanded form over terminals, connectors, wire and cable, conduit and hose, the announcement states.

Upon application of heat (275 F), the tubing shrinks in diameter to form a strong mechanical bond. This heating will not affect the flexibility of the irradiated tubing, the manufacturer states. Longitudinal shrinkage is less than 10%. Available in standard colors in sizes from 4 to 24 and in standard lengths of 4 ft. Other colors, sizes and lengths can be made to customer specifications.

Transformer

(3) *Westinghouse Electric Corp., P. O. Box* 2099, *Pittsburgh* 30, *Pa.*

This 15-kv molded outdoor current transformer, type CTOM-15, is available in current ratings of 10/5 through 800/5 amp. The new unit replaces the steel-fabricated type CTO and is smaller and lighter. With its 1.5 rating factor through 600 amp, it has 50% more overload capacity, the manufacturer states. A large removable conduit box permits easy and quick connections and change-outs due to increased load.



(4) HENNEY KILOWATT—A specially designed 72-v traction motor, incorporating high torque per ampere characteristics, is used to drive Eureka Williams Corp.'s Henney Kilowatt, an electric automobile demonstrated recently at the EEI meeting. The 9-in.-diameter motor is basically an electric industrial truck type motor, but it was specifically designed with inherent high efficiency for use on the Kilowatt by General Electric's Direct Current Motor & Generator Department. Utilizing the small car body design of the Renault Dauphine, the Kilowatt has a top speed of 35 mph while fully loaded. A completely new stepless electric control is being researched but initial production will use magnetic control for battery switching. The Kilowatt's range is about 40 miles a day if run constantly and 50 to 60 miles if operated at moderate speed with frequent stops. Built-in battery rechargers will be standard on the production model. Weight of the Kilowatt is 2,245 lb. Over-all length is 155 in., width 60 in., height 57 in. and wheelbase 89 in. Sale is presently being confined to the utility industry by Henney Motor Co. Division of Eureka Williams

ANNOUNCING

PENGO-Prope

—the most satisfactory pulling line available today!

* GREAT STRENGTH
(9,600 lbs. tensile for ¾" diam.)

* LIGHT WEIGHT
(11.7 lbs. per 100 ft., ¾" diam.)

* HANDLES AND SPLICES LIKE MANILA
in any climate or weather.

* WATERPROOF,
(even salt water) can't mildew; excellent dielectric properties.

PENGO-Prope is a synthetic rope of special construction for pulling line use. Although PENGO has other synthetic and manila pulling lines, we believe PENGO-Prope far surpasses these ropes in cost-saving performance.

PENGO-Miller

LINE STRINGING SWIVELS

Special models of the well-known MILLER swivels redesigned specifically for tension line stringing use.

The result is a reliable, heavy duty swivel of proper dimensions to pass through stringing sheaves and bullwheel grooves easily, without damage.

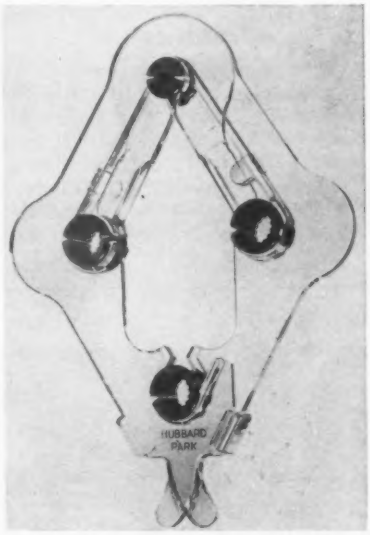
PETERSEN ENGINEERING CO., INC.
Santa Clara, California
Phone: AXminster 6-7712

E-10

Stringing Block

(5) *Sherman & Reilly Inc., 1st and Broad Sts., Chattanooga 2, Tenn.*

Model MH-303 spacer-type aerial cable stringing block may be changed easily in the field for stringing either the diamond or inverted wye configurations, this manufacturer states. High strength and light weight are secured by the use of aluminum alloy throughout. Guards are provided at each sheave position and at the messenger. Each sheave is mounted on antifriction ball bearings, permitting accurate sagging and also making possible long continuous pulls. Spacer ropes may be attached at either the top or bottom of the block.

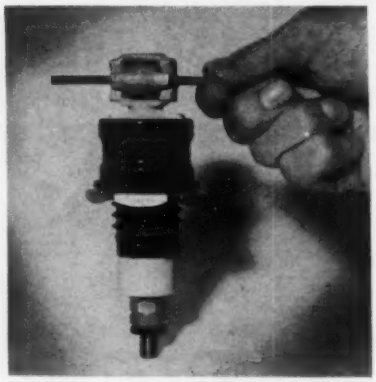


Spacer for Aerial Cable

(6) *Hubbard & Co., 200 S. Michigan Ave., Chicago 4, Ill.*

Called the Hubbard-Park, this new plexiglas aerial cable spacer features easy and economical installation. The spacer surrounds the cables and messenger and spaces them on 6-in. centers. Polyethylene grommets are slipped on to the various wires, which are said to be easily installed in the opened spacer. After the conductors and messenger are snapped into place, closing the spacer automatically locks the assembly into an integral unit without accessory parts such as belts, clips, keepers or tie wires.

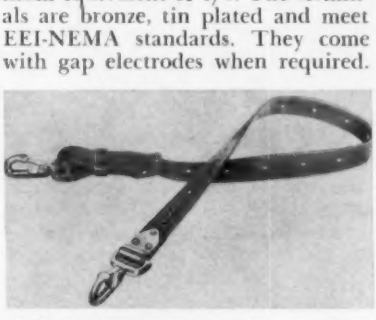
A complete line of aerial cable hardware for attachment is also available.



Bushing

(7) *Lapp Insulator Co., LeRoy, N. Y.*

A new low-voltage transformer bushing is designed for internal mounting with a single screw-on-type retaining nut. Only two loose parts are required for mounting each bushing, a cork-Buna N flange gasket for use with askarels or transformer oil, and the retaining nut. The new bushings are recommended by the manufacturer for distribution transformer applications to 1.2 kv with a choice of two terminals, for conductor sizes No. 8 to aluminum equivalent of 2/0 or No. 6 to aluminum equivalent of 4/0. The terminals are bronze, tin plated and meet EEI-NEMA standards. They come with gap electrodes when required.



Nylon Safety Straps

(8) *Mathias Klein & Sons, 7200 McCormick Rd., Chicago 45, Ill.*

New Klein-Kord nylon safety straps are woven from filament nylon. According to the manufacturer, stretch has been almost eliminated and when tested in use they were capable of test load of 2,750 lb. Multiple plies of strongly woven, predipped nylon are frictionized in neoprene and vulcanized. All buckles and snaps are drop-forged. No. 5294 nylon safety strap with red cotton center and No. 5295 all-nylon strap are available in 6-, 6½-, 7- and 8-ft lengths.

For additional information, use coupon, p. 100

Cable Joint

(9) *G & W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill.*

This manufacturer states that all materials required to make sealed pressure-tight joints for oil- or gas-filled, low- and medium-pressure aluminum-sheathed cable are available in kit form.

Housings may be specified with 4-, 5-, 6-, 8- and 10-in. diameters and with variable lengths for use with cables up to 5½ in. od. The housings are said to require no soldering or welding for attachment to cable sheaths but depend upon O-ring and compression-gasket seals, reducing skills required for installation.

Mechanical strength and hermetic seal are secured through internal split sheath clamps and compression glands. Bells fit snugly over cable sheath and housing to permit application of protective tape when jacketed sheath is used.

Ventilating Heater

(10) *Morrison-Pelsue Co., 2001 S. Bannock St., Denver 23, Colo.*

This unit is a 78-lb portable ventilator and heater with attached 300-w generator for electric light or soldering iron. A new waterproof weatherguard protects the electric outlets on the generator. The case has been redesigned with rounded corners for added safety and streamlining. According to the manufacturer, the unit has greater efficiency and an increased air volume.

Model PE-G delivers from 300 to 800 cfm of fresh heated air. This heated air passes through the heat exchanger and all products of combustion pass into the atmosphere through the burner exhaust so that only safe fresh, heated air is forced into the manhole area.

Your worries are over from the moment you choose Killark custom-made switch racks because Killark provides a complete service — design to assembly. First, Killark prepares and submits a preliminary blueprint of the entire unit, drawn to your specifications. After approval, the switch rack is assembled, wired, and sealed *at the factory* by Killark workers with experience and equipment to do the job right. You receive a switch rack ready to install.

The two racks shown are examples of the type of custom-made units Killark can provide. Each has been made to meet the users exact specifications, and is completely pre-wired and pre-sealed. Killark's rust-proof, non-sparking *aluminum* enclosures have been used throughout the assemblies to give added years of trouble-free performance.

You get these extras when you order Killark custom-made racks:

Services of expert Killark engineers • One supplier for all components • Dependable Killark aluminum enclosures • Fast delivery • Easy installation.

Racks for outdoor or indoor, hazardous or non-hazardous locations. Write for complete literature.

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ELECTRIC MANUFACTURING CO.
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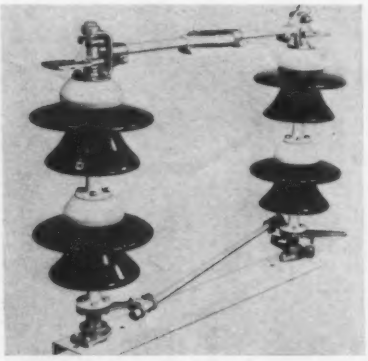
Sales Representatives and Warehouse Stocks in Principal Cities
6021

Killark Supplies Everything But the Current!

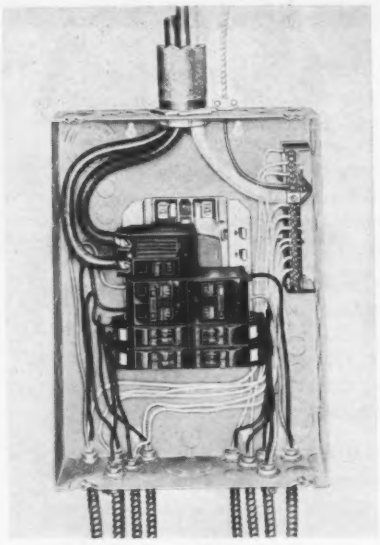
For phone number of closest representative see advertising index in back of book.



Switch

(11) *Southern States Equipment Corp., Hampton, Ga.*

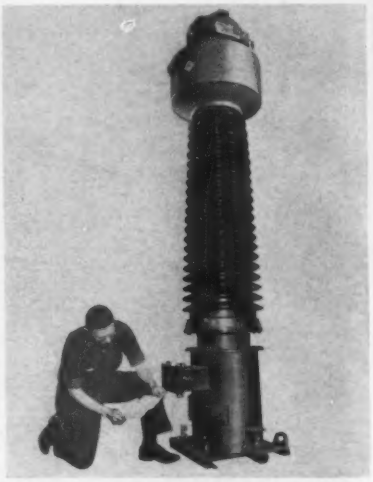
A new braidless, center, side break switch is designated type GG and is available in voltage ratings from 34.5 kv through 161 kv and in continuous current ratings of 600 and 1,200 amp. A feature is a swivel assembly, providing low resistance current transfer points, adequate capacity for short circuit current and freedom from corrosion and contamination. Both insulator stacks of the GG rotate for switch operation.



Plug-In Breakers

(12) *Distribution Unit, General Electric Co., Plainville, Conn.*

New 70- and 100-amp, two-pole circuit breakers that plug into standard G-E load centers are suitable for use in the manufacturer's Twin units rated 125 amp and above. The new breakers are rated 120/240 v a-c and may be installed either as the main service disconnect or in 200-amp panels as a branch circuit disconnect. They are designed on a 1-in.-per-pole modulus and are interchangeable with other G-E plug-in circuit breakers. Details in bulletin GEA-7071.



Transformer

(13) *Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.*

Extension of the manufacturer's line of current transformers to include a 900-kv BIL unit has been announced. The oil-filled, hermetically sealed, corona-free transformer is designed for heavy duty, accurate metering and relaying service, it is stated. Utilizing new insulation techniques and refinements in use of materials, the new unit weighs about 60% less than a conventionally built unit, it is stated. Complete with oil, it is said to be comparable in weight to a 250-kva distribution transformer.

Distribution Transformer

(14) *Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 33, Mo.*

This manufacturer has announced transformer uprating capability of 12% with no reduction in normal life expectancy for its entire line of pole-type distribution transformers in ratings of 5 through 167 kva, 18 kv insulation class and below. According to the manufacturer, these ratings feature new coil designs with lower impedances and higher short circuit strength; advantages achieved by employing improved insulation system design to provide greater overload capability without increasing hot spot temperature rise beyond the present ASA Standard limit of 65 C.

Electrical Operators

(15) *Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.*

A line of electrical operators allows type AB circuit breakers to be remotely controlled. According to the manufacturer, models with rated control voltages of 120-, 240-, 480- or 600-v a-c and 125-v d-c can be supplied. They will actuate breakers rated to 100 amp at 600 v in frame sizes designated E, EH and F.

These operators may be used for a variety of remote control applications such as engine generators, battery chargers, irrigation and oil field pumps and lighting. They can also be used for capacitor-bank switching, as limited duty motor starters or as an overload sensing device.

Breakers that are mounted on panelboards, switchboards or bus-duct plug-in units can be equipped with the new electrical operators. They do not impair overload protector features of a breaker and do not prevent the breaker from being manually operated, the manufacturer states.

Fittings

(16) *The Wiremold Co., Hartford, Conn.*

Four new fittings claimed to obsolete 10 fittings previously required are intended for use with this manufacturer's series 200, 500 and 700 surface metal raceways. Designated 57200, the fittings consist of a single pole switch and box, utility box, duplex receptacle and box and duplex grounding receptacle and box. The grounding receptacle previously was not available in the 200 series.

The switch is rated at 10 amp, 125 v or 5 amp, 250 v. Both duplex receptacle fittings are rated 15 amp, 125 v.

For more data, use coupon p 100

fully adjustable, TUBULAR BUS SUPPORT*

This bus support, made of high-strength bronze throughout, has the following outstanding features:

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

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DOSSERT MFG. CORP.

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EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

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Connectors

(17) *Bronco-Grip Connectors, Western Insulated Wire Co., Los Angeles 58, Calif.*

Entering the electrical connector field, Western Insulated Wire hass announced Bronco-Grip Connectors for both copper and aluminum wire. Ordered initially are split bolt, vise grip, service entrance, clamps, parallel connectors, aluminum compression sleeves, solderless terminal lugs, ground clamps and straps. A 30-page catalog describes the line.

Conduit

(18) *Orangeburg Mfg. Co., Division of the Flintkote Co., 30 Rockefeller Plaza, New York 20*

An improved fiber conduit is claimed to have better weathering resistance and to travel and join better. This Klean-Kote has a tough, nonbrittle protective coating for clean and safe handling. According to the manufacturer, the conduit is immune to electrolytic action and resists the corrosive action of acids or alkalies in soils as well as salt water, sewer gases, oils and greases.

Electric Furnace

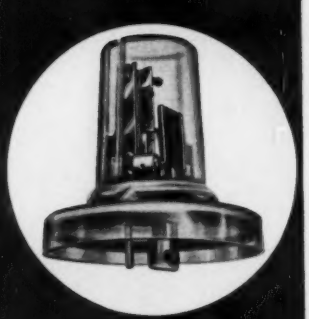
(19) *Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14, Ill.*

The Electro-Flo furnace features Selective-Sequencer, a modulating device that controls up to nine stages of heating, depending on furnace capacity. It actuates from three to nine motor-operated switches, one for each pair of heating elements of approximately 10,000-Btu output.

The heating elements controlled by the Selective-Sequencer add heat in steps of 10,000 Btu/hr. If the heat demand lies between the capacities of any two heating elements, the sequencer will switch each on, as required, to maintain the optimum comfort condition.

The Electro-Flo is available in four models, each offered for operation with 208, 220, 230 or 240 v. Minimum Btu/hr output of the smallest size is 23,085, with the range extending to a maximum capacity of 92,205 for the largest furnace. According to the manufacturer, the furnace and blower can be installed in any position, and the same units can be arranged as vertical, counterflow or horizontal models at the installation site. Summer cooling up to 5 hp can be added.

WHERE lighting COUNTS MOST



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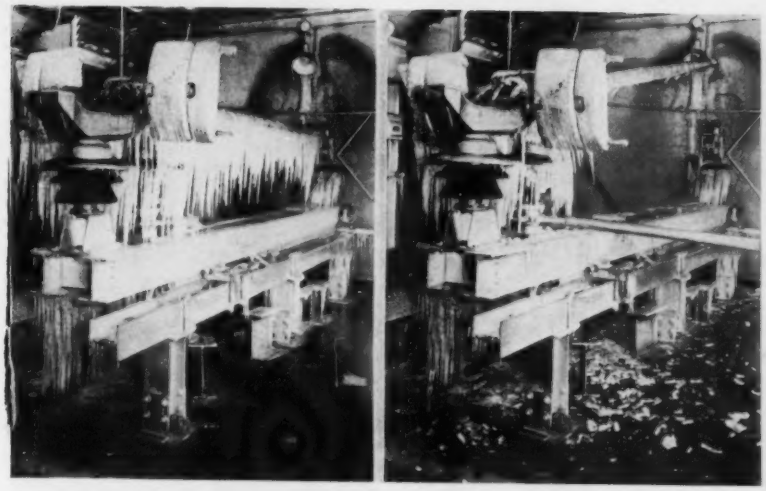
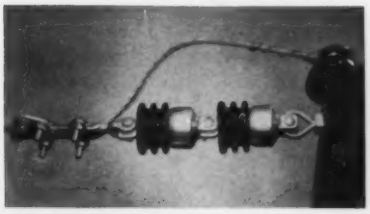


(20) TEST—A 345-kv, 1,600-amp Type MK-40 vertical-break air switch has been successfully tested under ice conditions inside a freezer chamber, according to its manufacturer, H. K. Porter Co., Delta-Star Electric Division. The high-voltage power switch normally stands on three insulator stacks, seven high. With blade fully open, it reaches a total height of 24 ft 9 in. Shown left: 345-kv switch frozen under ¾-in.-thick ice. Right: the switch breaks the ice and opens successfully. Closing followed the same procedure.



Insulator

(21) *A. B. Chance Co., Centralia, Mo.*

This new distribution dead-end insulator features all-aluminum hardware. The forged aluminum cap and stud greatly incresae the insulator's service life in corrosive atmospheres, the manufacturer states, and makes the total weight of the insulator 30% lighter than standard distribution insulators. The unit also has a new porcelain shell contour to give it a higher impact strength and improve the appearance of distribution construction.

A square tongue on the stud interlocks into the clevis of another insulator to prevent breakage of the porcelain when handling in line construction and maintenance.

(22) An appliance motor switch repair kit, designed to handle servicing of almost all appliance motors, has been introduced by General Electric. It contains 11 basic switches, plus hardware and tools needed to make up the 130 switches required to service appliance motors. Compact in design, the kit stands 4 in. high and is 10x10 in. in shape.

Power Pumps

(23) *Greenlee Tool Co., Rockford, Ill.*

Two high-pressure power pumps, No. 797E-TA and No. 797VE-TA, are designed to speed operation on a variety of hydraulically activated equipment. The former features a simple radial-type pump with two diametrically opposed pistons driven by a simple eccentric drive shaft. A four-way spool-type control valve, mounted on top of the pump unit, controls high-pressure advance of ram and low-pressure return.

No. 797VE-TA is identical but includes an auxiliary low-pressure pump mounted on top of pump housing. No. 797E-TA is illustrated.

Noninterchangeable Enclosure

(24) *Wadsworth Electric Mfg. Co. Inc., Covington, Ky.*

The manufacturer's new 200-amp fusible main has provisions for 24-32 or 40 circuits. It will fit between studs set 16 in. on center and is for three-wire service, solid neutral, 120/240-v a-c. The cabinet is available in either surface or flush mounting with dead-front construction, also for indoor and raintight installations. It is UL listed.

For more information, fill in coupon, p. 100

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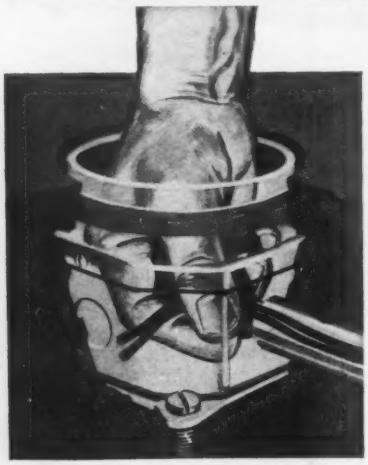

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BULLETINS ETC.

(25) ALUMINUM CONDUIT—A brochure describing its new aluminum rigid conduit is available from Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif.

(26) CIRCUIT BREAKERS—Circuit breaker catalog No. 17 is available from Killark Electric Mfg. Co., Vandeventer and Easton Ave., St. Louis, Mo.

(27) ELECTRIC HEAT COSTS—Estimated costs for electric heat in 105 major cities and marketing areas are given in a bulletin published by Sun-Tron Corp., 7435 W. Wilson Ave., Chicago 31. Also included are details on installation procedures. The manufacturer suggests that the area for which information is desired be specified.

(28) CIRCUIT RECLOSER—I-T-E Circuit Breaker Co. has published a new bulletin on its type MB-2 automatic circuit recloser. Included are descriptive details, application, dimensions and ordering data. Copies are available from I-T-E representatives or from the Greensburg Division, Greensburg, Pa.

(29) CONDUIT—Data on rigid aluminum electrical conduit are available in an illustrated 32-page manual published by Kaiser Aluminum & Chemical Sales. Copies may be secured from the company's Department NR-45, 300 Lakeside Drive, Oakland 12, Calif.

(30) BUS DUCT—Application data for impedance bus duct are contained in a 20-page booklet offered by Westinghouse as No. 50-662. Available from the manufacturer, P.O. Box 2099, Pittsburgh 30.

(31) CAPACITORS—Bulletins 8145 and 8148 published by Federal Pacific Electric Co. cover pole-type capacitors and capacitor assemblies used by utilities for power-factor improvement. Copies are available from the manufacturer's general office, 50 Paris St., Newark 1, N.J.

(32) ALUMINUM LINE TRAPS—A bulletin on its aluminum line traps for electric utility systems has been published by G-E's communication products department. This bulletin, ECC-113, can be secured from General Electric Communciation Products Department, P.O. Box 4197, Lynchburg, Va.

(33) RIGID PVC CONDUIT—A 20-page catalog on rigid polyvinyl chloride electrical conduit has been issued by Kraloy Plastic Pipe Co., 402 W. Central Ave., Santa Ana, Calif. Included are test results, specification information, installation instruction, corrosion resistant charts.

(34) WIRING GUIDE—Surface metal raceways and fittings, multi-outlet assemblies and lighting equipment are covered in a revised 152-page catalog and wiring guide from the Wiremold Co., Hartford, Conn. Included is a new section on the National Electrical Code as it affects the manufacturer's products, including a table showing capacities of Wiremold boxes. The catalog also contains tables showing revised UL-listed capacities on Plugmold 2100 and 3000.

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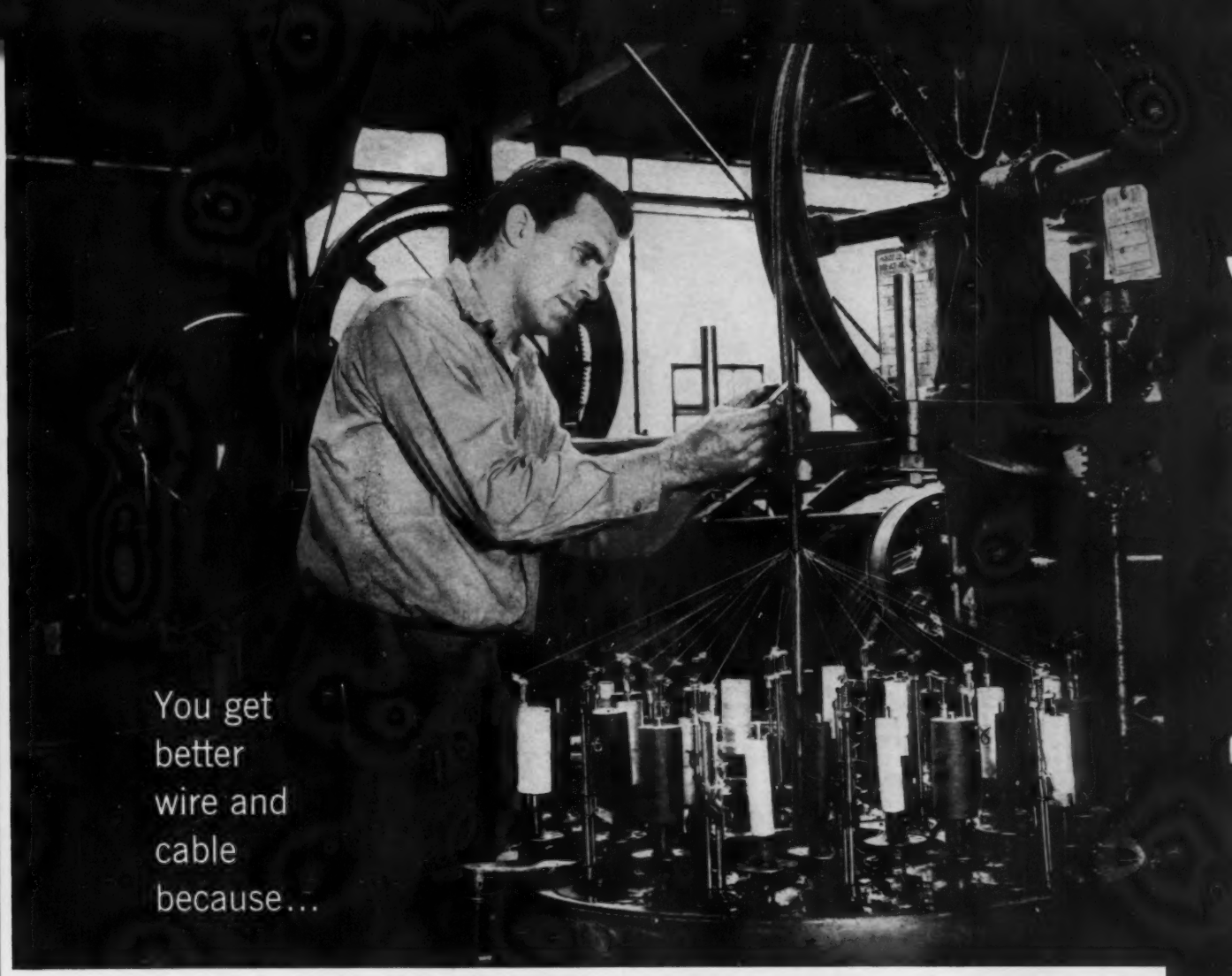

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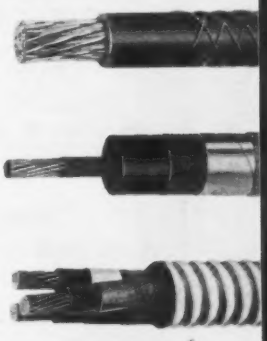

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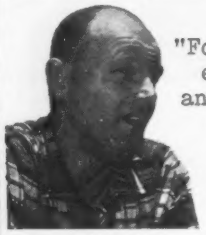

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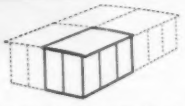

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I-T-E Circuit Breaker Co. 28, 29
South San Francisco ..... PLaza 6-8660
Los Angeles ..... MAdison 2-7134
Denver ..... AMherst 6-1404
Phoenix ..... CRestwood 9-9666
Seattle: Garland-Affolter Eng. Corp. ..... MUtual 2-4958
Portland: Garland-Affolter Eng. Corp. ..... CApitol 3-7349
Salt Lake City: Riter Eng. Co. .. INgersol 7-9449
Butte: McDonough, R. E. ..... BUtte 2-5447
El Paso: R. L. Brewer Co. Inc. .. KEystone 2-7651

BullDog Electric Products Div. 4, 5, 75
Oakland: Safety Switchboard Co. ..... LOckhaven 2-4945
Los Angeles: BullDog Elec. Products of L. A. ..... OVerbrook 5-8200
Portland: Coast Elec. & Mfg. Co. ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. .. AComa 2-4841

Jet Line Products, Inc. 83
San Francisco: Lippincott Co. .. UNderhill 3-8240
Los Angeles: Lippincott Co. .... MAdison 8-8186
Salt Lake City: Lippincott Co. ..... CRestwood 8-8281
Denver: Ralph L. Millie ..... FR 7-9591
Seattle: Vernon B. Cobb ..... EAst 4-6178

Johns-Manville Corp. 30
San Francisco ..... DOuglas 2-4353
Los Angeles ..... LUdlow 7-2141
Seattle ..... MElrose 3-4300
Denver ..... KEystone 4-6378
Salt Lake City ..... EMpire 4-8446
Portland ..... CApitol 3-8260

KPF Electric Co. 42, 43
Los Angeles: Jack Payne Co. .. MAdison 4-7317
San Francisco: Baxter Co. ..... MArket 1-8636

Kearney Corp., James R. 84, 85
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Seattle ..... MAin 4-2388
Portland ..... CApitol 8-4173
Spokane ..... MAdison 4-3285
Phoenix ..... ALpine 2-5858
San Diego ..... CYpress 6-2245
Salt Lake City: Consly Engineering Co. ..... EMpire 3-5013
Golden, Colo.: Robert C. Smith ..... CRestview 9-5279

Killark Electric Mfg. Co. 95
San Francisco: F. M. Nicholas .. YUkon 2-1964
Los Angeles: Kenneth Anderson Co. ..... ANgelus 8-6771
Seattle: Northwestern Agencies, Inc. ..... MAine 3-8882
Denver: Kenneth B. Schumann Co. ..... AComa 2-8913
Phoenix: Kenneth Anderson Co. AMherst 5-2863

(Continued on page 104)

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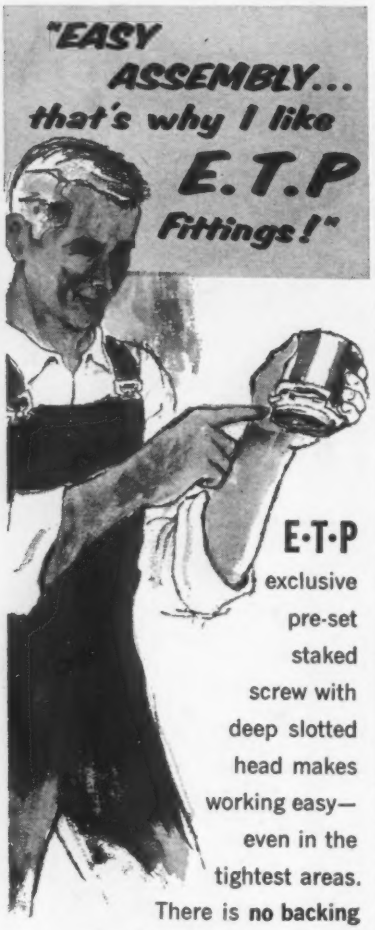
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Line Material Industries 3

San Francisco	PLaza 5-8600
Los Angeles	RAymond 3-6251
Portland	CApitol 2-1981
Seattle	ATwater 3-6368
Spokane	KEystone 5-2461
Salt Lake City	ELgin 5-6257
Phoenix: J. E. Redmond Supply	ALpine 4-8471
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Butte	Phone: 8340
Denver	FL 5-1689 and 1680
Sacramento, Calif	GI 2-6264
Anchorage (Spenard) Alaska	FA 2-2649

McGraw-Hill Book Co. 35

Moloney Electric Co. 27

Garland Affolter in following cities:

San Francisco	EXbrook 7-1800
Los Angeles	MAdison 4-1864
Portland	CApitol 3-7349
Seattle	MUtual 2-4950
Denver: Hamilton Associates	CHerry 4-1505
Salt Lake: Riter Engineering	EMpire 3-7933

Pacific Gas and Electric Co. 23

San Francisco	SUtter 1-4211

Petersen Engineering Co. 87, 94

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Santa Clara, Calif.	AX 6-7712

Porta House 102

Oakland	OLympic 2-7237
Sacramento: Robert Cronin	GIlbert 3-8543
Portland: Bardi Gen. Contractors	PRospect 5-4354
Los Angeles: Constructors Supply Co.	LUdlow 3-4158
Los Angeles: Ball & Black	ANgelus 9-7586
Santa Ana: Blystone Equip. Co.	KImberly 2-3918

Porter Co. Inc., H. K., National Electric Div. 26

San Francisco	UNderhill 1-1145
Los Angeles	RAymond 3-4654
Seattle	MAin 3-3775
Salt Lake City	DAvis 2-2701
Denver	PEarl 3-3741

Precision Multiple Controls 98

San Francisco: Wrathall & Krusi	EXbrook 7-3593
Los Angeles: Industrial Engineering & Equip. Corp.	DUnkirk 1-1281
Denver: Jim Dawson Co.	ALpine 5-7194
Salt Lake City: Leonard M. Slusser	ELgin 5-2322
Vancouver, Wn.: Bill Horning Sales	OXford 4-4475

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Portland	MErcury 9-2161
Medford: H. L. Mooney	SPring 2-9948
San Jose: N. R. Beebe	ANdrews 4-5641
Pasadena: D. B. Cole	SYlvan 0-5977
Salt Lake City: T. R. Van Wagoner Co.	INgersol 6-2461
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Anchorage: J. P. Bagoy	BRoadway 7-8011

Ripley Co. 98

Portland: Wm. J. Cottrell	CApitol 7-6191
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Oakland: J. H. Ormond Co.	TWinoaks 3-3235
Los Angeles: A. W. Nash Co.	ANgelus 9-7304

Rome Cable Div. of Alcoa 33, 34

Los Angeles	RAymond 3-3631
San Francisco	VAlencia 6-3580
Seattle	MAdison 4-3017
Salt Lake City	ELgin 9-8811
Denver	KEystone 4-0533

Royal Electric Corp. 86

Los Angeles: Eckert-Lloyd Co.	Richmond 7-9655
San Francisco: Eckert-Lloyd Co.	HEmlock 1-5792
Seattle: Northwestern Agencies	MAin 3-8882
Portland: Northwestern Agencies	CApitol 7-0434
Phoenix: Wm. Bonndorf	CRestwood 7-1662
Denver: Hyde Electronics Co.	WEst 6-3456

Sangamo Electric Co. 88, 89

San Francisco: L. A. Nott	HEmlock 1-4738
Los Angeles: (Factory Sales)	DUnkirk 7-2336
(Time Switches)	ANgelus 8-6771
Seattle: T. R. Wood	MAin 3-8204
Denver: Mt. States Machinery	CHerry 4-7421
Phoenix: J. E. Redmond Co.	ALpine 4-8471
Portland: R. L. Schoenberger	CApitol 3-8742
Butte: R. E. McDonough	Butte 2-5447
Tucson	AXtel 8-4801
Albuquerque: Gorman Engineering	CHapel 7-1596
El Paso: Gorman Engineering	KEystone 2-3449

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San Francisco	MArket 1-8474
Los Angeles	ORegon 8-8981
Salt Lake City: J. R. Christensen	EMpire 3-4419
Seattle: F. C. Scharr	ATwater 2-9230
Portland: Clay Barton	CApitol 8-3520

Southern California Edison Co. 10

Los Angeles	MAdison 4-7111

Southern Electrical Co. 15

Garland-Affolter Eng. Co. in following cities:

San Francisco	EXbrook 7-1800
Los Angeles	MAdison 4-1864
Portland	CApitol 3-7349
Seattle	MUtual 2-4950
Denver: Hamilton Associates	CHerry 4-1505
Phoenix: R. E. Coulson Co.	WIndsor 3-8935

Southern States Equipment Corp. 56

Seattle: Jos. C. Platt	MAin 3-6141
Salt Lake City: H. Lee Rawlings Co.	ELgin 9-8811
Denver: R. T. Lewis Co.	EAst 2-1082
Los Angeles: W. E. Kirk Co.	MAdison 4-3651
Lake Grove, Ore.: C. F. Selby	NEptune 6-1486
Oakland: John H. Ormond	TWinoaks 3-3235

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Los Angeles	CApitol 1-1171
San Francisco	JUniper 7-4590
Seattle	EAst 3-1474
Portland	BEImont 4-8488
Denver	KEystone 4-6234
Salt Lake City	DAvis 2-5859
Phoenix	ALpine 8-6448
El Paso	KEystone 3-0544
Spokane	FAirfax 8-3690
San Diego	BEImont 3-7621
Fresno	AMherst 8-6268

Subox, Inc. 6

San Francisco: Wrathall & Krusi	EXbrook 7-3593
Los Angeles: R. E. Cunningham & Son	MAdison 8-1105
Portland: Wm. J. Cottrell & Assoc.	CApitol 7-6191
Seattle: Fred H. Carlson Co.	ATwater 4-4630
Denver: Ambler Co.	TAbor 5-8885

Turner Electric Corp. 102

Fred W. Carlson in following cities

Seattle	ATwater 4-4630
Portland	CApitol 8-3798
Butte	Phone 8916
Los Angeles: Industrial Eng. & Equip. Corp.	DUnkirk 1-1281
Denver: Hamilton Associates	CHerry 4-1505

Wagner Electric Corp. ..... 2nd Cover

South San Francisco	PLaza 6-0520
El Segundo, Calif.	ORegon 8-7671
Portland	CApitol 7-3654
Salt Lake City	EMpire 3-5013
Denver	CHerry 4-7421
Seattle	MAin 2-2342

Westinghouse Electric Corp. 8, 9, 20, 21, 36, 37

San Francisco	EXbrook 2-5353
Los Angeles	MAdison 6-3881
Denver	KEystone 4-8121
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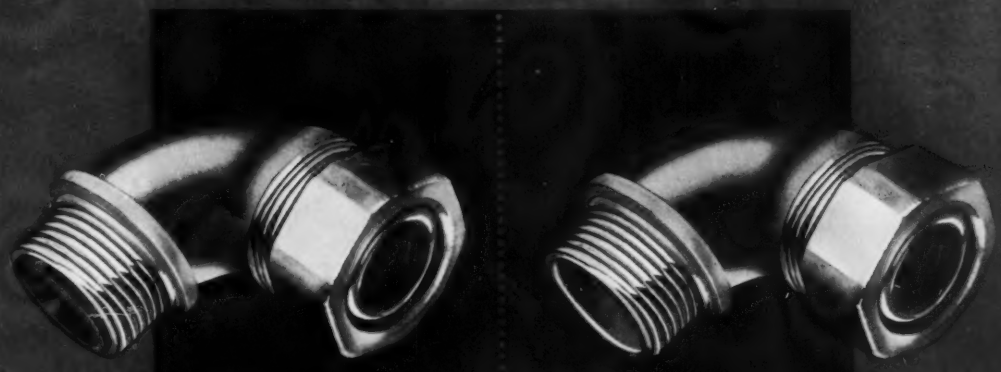

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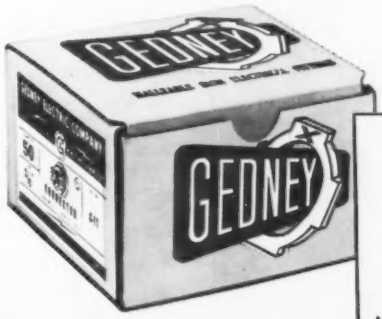

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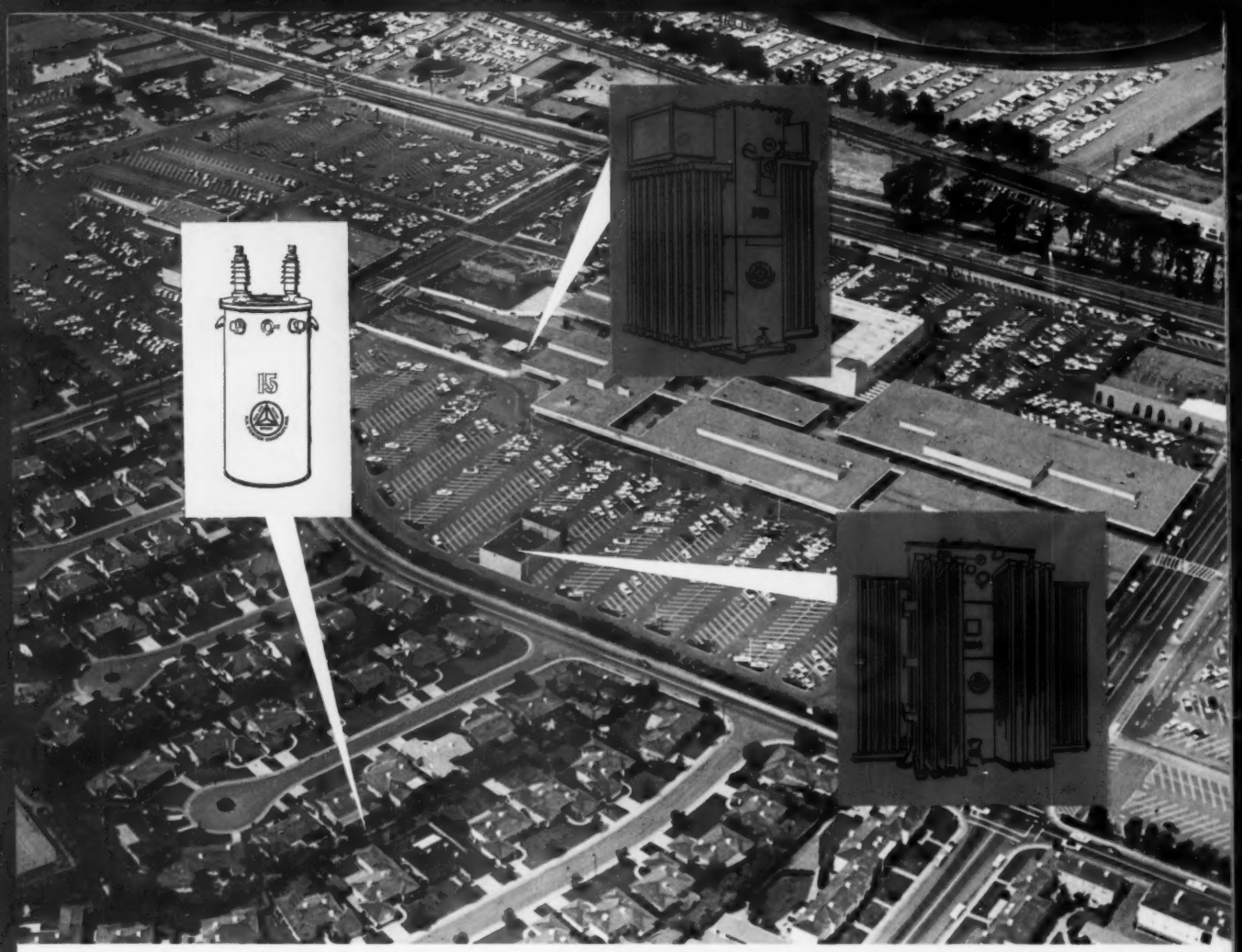

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